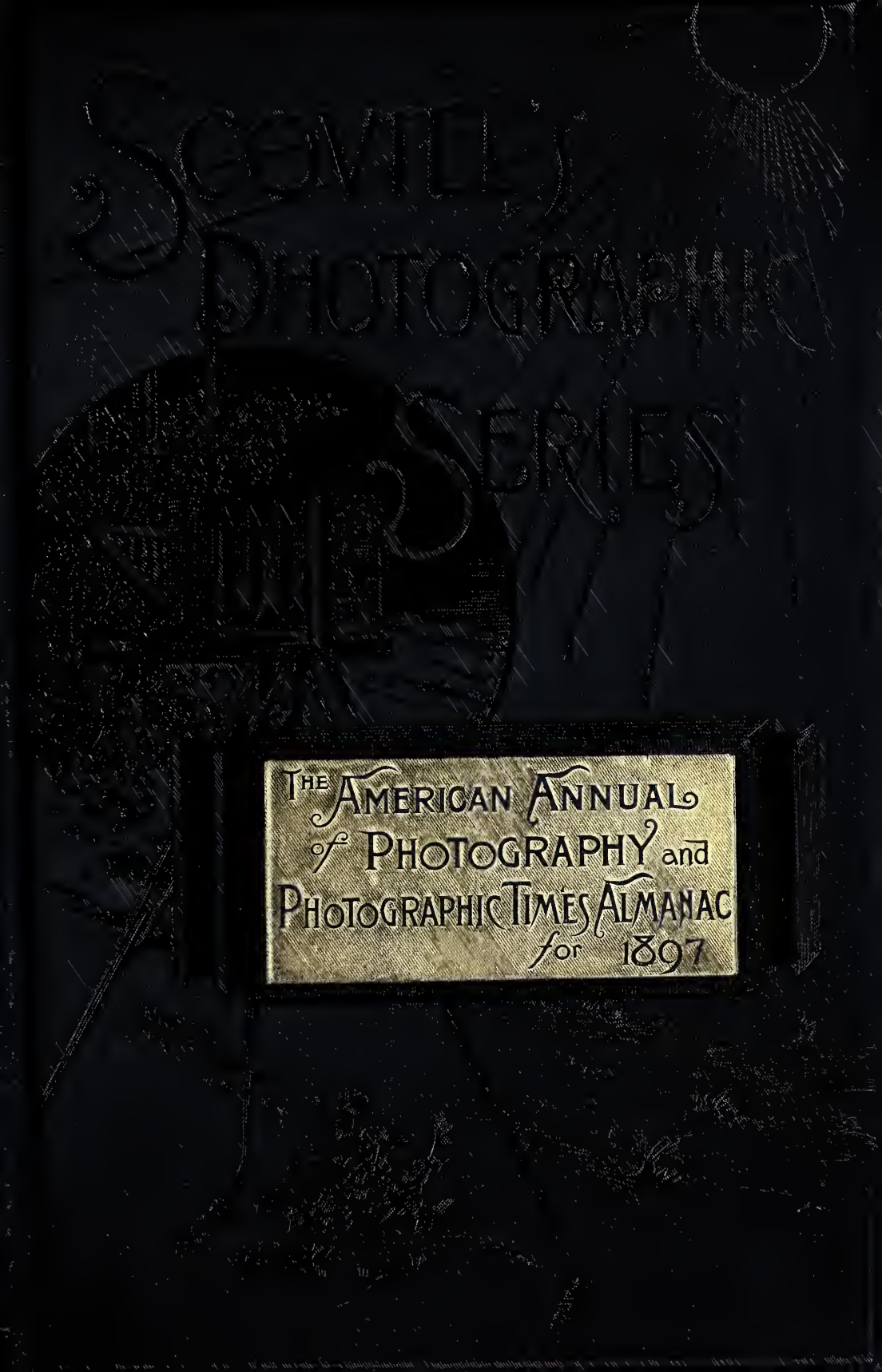
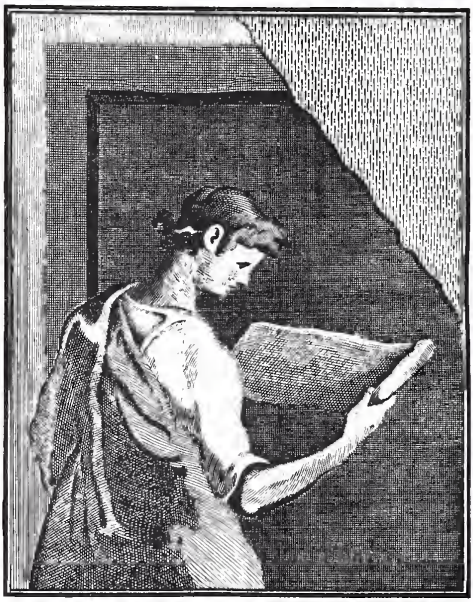
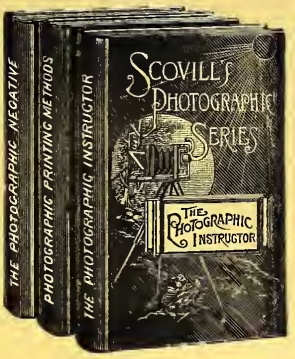

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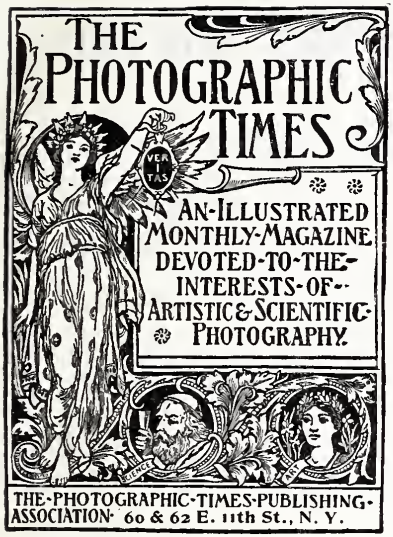
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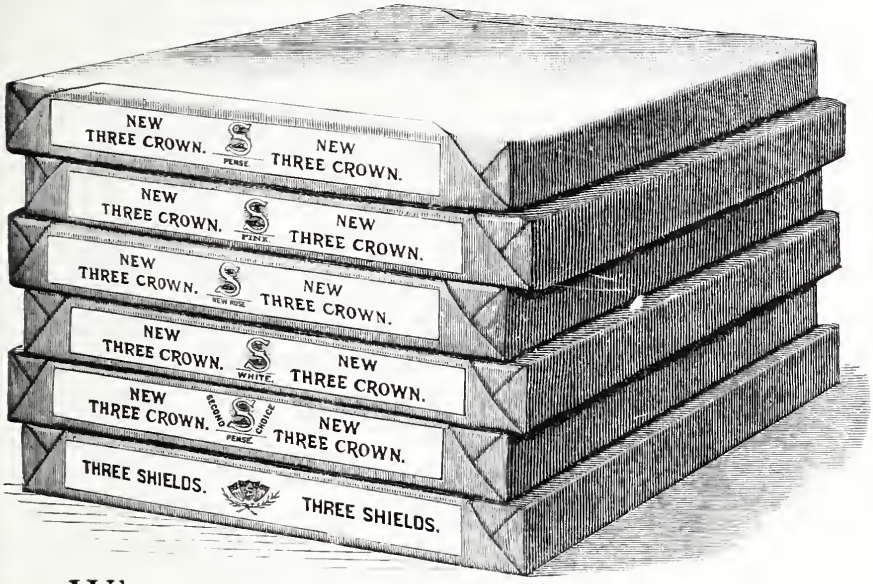
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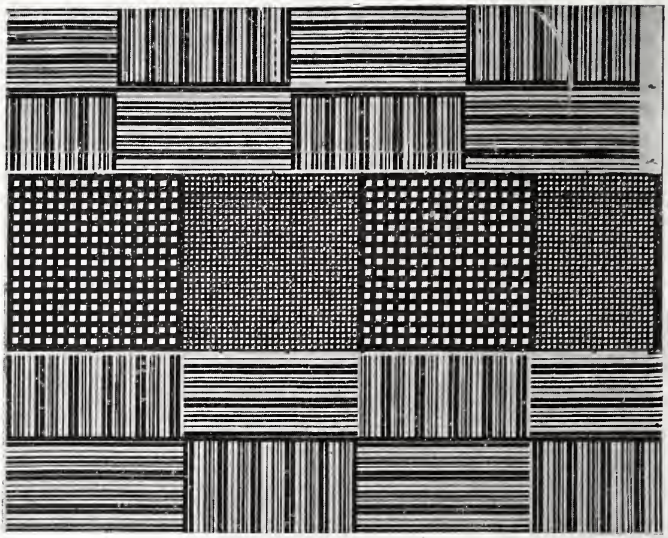
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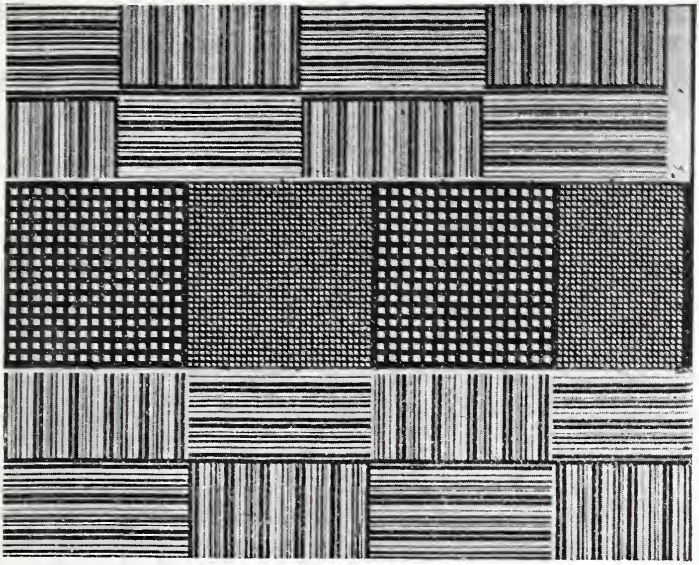
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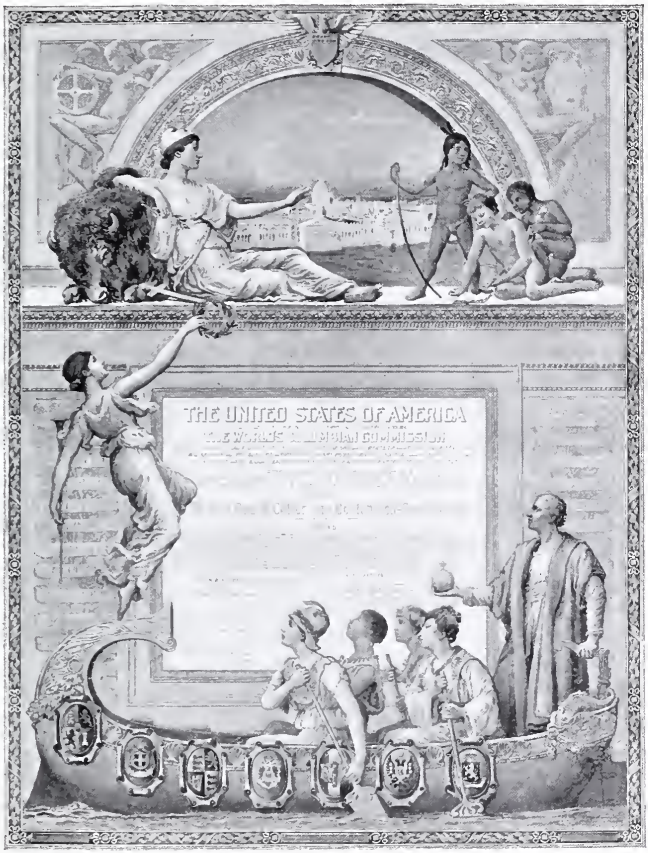
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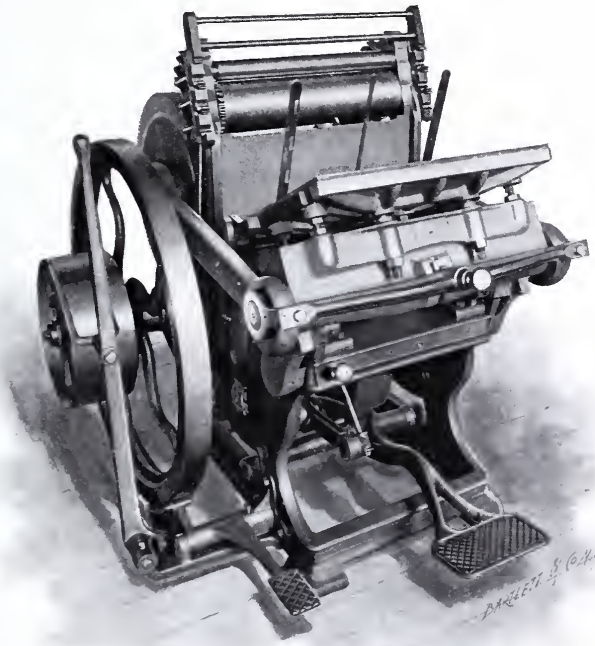
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EDITOR OF

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The Scovill & Adams Company

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PREFACE.

THE present volume is the eleventh of the series, and it has been our earnest endeavor to make it superior to its predecessors. Our readers will be the best judges of our efforts.

To the many kind friends who have so readily and willingly contributed the articles and pictures we tender our best thanks.

THE EDITOR.

NEW YORK, 1896.

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The "Elite" Studio Stand	lxiv
"The Reversible Landscape."	lxvii
The Scovill Adjustible Tripod	lxviii
The Scovill Panoramic Camera	lxix
The Henry Clay Cameras	lxxiii
The Waterbury Cameras	lxxiv
The Waterbury Trays	lxxv
The Presto	lxxvi
The New York Plate	lxxxiv
The Photochrome Engraving Co	lxxxviii
The Air Brush M'f'g Co	lxxxix
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JANUARY, 1897.

1st MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
1	1	F	7 25	4 43
2	2	Sa	7 25	4 44
3	3	☉	7 25	4 45
4	4	M	7 25	4 46
5	5	Tu	7 25	4 47
6	6	W	7 25	4 48
7	7	Th	7 25	4 49
8	8	F	7 24	4 50
9	9	Sa	7 24	4 51
10	10	☉	7 24	4 52
11	11	M	7 24	4 53
12	12	Tu	7 23	4 54
13	13	W	7 23	4 55
14	14	Th	7 23	4 56
15	15	F	7 22	4 57
16	16	Sa	7 22	4 59
17	17	☉	7 21	5 00
18	18	M	7 21	5 01
19	19	Tu	7 21	5 02
20	20	W	7 20	5 03
21	21	Th	7 19	5 04
22	22	F	7 18	5 05
23	23	Sa	7 17	5 07
24	24	☉	7 17	5 08
25	25	M	7 16	5 09
26	26	Tu	7 16	5 10
27	27	W	7 15	5 11
28	28	Th	7 14	5 13
29	29	F	7 13	5 14
30	30	Sa	7 12	5 15
31	31	☉	7 12	5 16

Moon's Phases.

New M., Jan. 3, 1 h. 3 m., morn.
First Q., Jan. 10, 4 h. 46 m., eve.
Full M., Jan. 18, 3 h. 17 m., eve.
Last Q., Jan. 25, 3 h. 8 m., eve.

FEBRUARY, 1897.

2d MONTH. 28 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
32	1	M	7 11	5 18
33	2	Tu	7 10	5 19
34	3	W	7 09	5 20
35	4	Th	7 07	5 21
36	5	F	7 06	5 22
37	6	Sa	7 05	5 23
38	7	☉	7 04	5 25
39	8	M	7 03	5 26
40	9	Tu	7 02	5 27
41	10	W	7 01	5 28
42	11	Th	7 00	5 30
43	12	F	6 58	5 31
44	13	Sa	6 57	5 32
45	14	☉	6 56	5 34
46	15	M	6 55	5 35
47	16	Tu	6 53	5 36
48	17	W	6 52	5 37
49	18	Th	6 51	5 39
50	19	F	6 49	5 40
51	20	Sa	6 48	5 41
52	21	☉	6 46	5 43
53	22	M	6 45	5 44
54	23	Tu	6 44	5 45
55	24	W	6 42	5 46
56	25	Th	6 41	5 48
57	26	F	6 39	5 49
58	27	Sa	6 38	5 50
59	28	☉	6 37	5 51

Moon's Phases.

New M., Feb. 1, 3 h. 13 m., eve.
First Q., Feb. 9, 2 h. 25 m., eve.
Full M., Feb. 17, 5 h. 11 m., morn.
Last Q., Feb. 23, 10 h. 43 m., eve.

MARCH, 1897.

3d MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises.	N. Y. City. Sun sets.
			H. M.	H. M.
60	**1**	M	6 35	5 53
61	**2**	Tu	6 34	5 53
62	**3**	W	6 32	5 54
63	**4**	Th	6 30	5 55
64	**5**	F	6 29	5 56
65	**6**	Sa	6 27	5 57
66	**7**	☉	6 25	5 58
67	**8**	M	6 24	5 59
68	**9**	Tu	6 22	6 00
69	**10**	W	6 20	6 01
70	**11**	Th	6 19	6 02
71	**12**	F	6 17	6 03
72	**13**	Sa	6 16	6 04
73	**14**	☉	6 14	6 05
74	**15**	M	6 12	6 06
75	**16**	Tu	6 11	6 08
76	**17**	W	6 09	6 09
77	**18**	Th	6 07	6 10
78	**19**	F	6 06	6 11
79	**20**	Sa	6 04	6 12
80	**21**	☉	6 02	6 13
81	**22**	M	6 01	6 14
82	**23**	Tu	5 59	6 15
83	**24**	W	5 58	6 16
84	**25**	Th	5 56	6 17
85	**26**	F	5 54	6 18
86	**27**	Sa	5 52	6 19
87	**28**	☉	5 51	6 20
88	**29**	M	5 49	6 21
89	**30**	Tu	5 47	6 22
90	**31**	W	5 45	6 23

Moon's Phases.

New M., March 3, 6 h. 56 m., morn.
First Q., March 11, 10 h. 28 m., morn.
Full M., March 18, 4 h. 28 m., eve.
Last Q., March 25, 7 h. 0 m., morn.

APRIL, 1897.

4th MONTH. 30 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises.	N. Y. City. Sun sets.
			H. M.	H. M.
91	**1**	Th	5 44	6 24
92	**2**	F	5 42	6 26
93	**3**	Sa	5 41	6 27
94	**4**	☉	5 39	6 28
95	**5**	M	5 37	6 29
96	**6**	Tu	5 36	6 30
97	**7**	W	5 34	6 31
98	**8**	Th	5 33	6 32
99	**9**	F	5 31	6 33
100	**10**	Sa	5 30	6 34
101	**11**	☉	5 28	6 35
102	**12**	M	5 26	6 36
103	**13**	Tu	5 25	6 37
104	**14**	W	5 24	6 38
105	**15**	Th	5 22	6 39
106	**16**	F	5 20	6 40
107	**17**	Sa	5 19	6 41
108	**18**	☉	5 17	6 42
109	**19**	M	5 16	6 43
110	**20**	Tu	5 14	6 44
111	**21**	W	5 13	6 45
112	**22**	Th	5 11	6 46
113	**23**	F	5 10	6 47
114	**24**	Sa	5 08	6 48
115	**25**		5 07	6 49
116	**26**	M	5 06	6 50
117	**27**	Tu	5 04	6 51
118	**28**	W	5 03	6 52
119	**29**	Th	5 02	6 53
120	**30**	F	5 00	6 55

Moon's Phases.

New M., April 1, 11 h. 24 m., eve.
First Q., April 10, 3 h. 27 m., morn.
Full M., April 17, 1 h. 25 m., morn.
Last Q., April 23, 4 h. 48 m., eve.

MAY, 1897.

5th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
121	**1**	Sa	4 59	6 56
122	**2**	☉	4 58	6 57
123	**3**	M	4 56	6 58
124	**4**	Tu	4 55	6 59
125	**5**	W	4 54	7 00
126	**6**	Th	4 53	7 01
127	**7**	F	4 52	7 02
128	**8**	Sa	4 51	7 03
129	**9**	☉	4 49	7 04
130	**10**	M	4 48	7 05
131	**11**	Tu	4 47	7 06
132	**12**	W	4 46	7 07
133	**13**	Th	4 45	7 08
134	**14**	F	4 44	7 09
135	**15**	Sa	4 43	7 10
136	**16**	☉	4 42	7 11
137	**17**	M	4 41	7 12
138	**18**	Tu	4 40	7 13
139	**19**	W	4 39	7 14
140	**20**	Th	4 39	7 15
141	**21**	F	4 38	7 16
142	**22**	Sa	4 37	7 17
143	**23**	☉	4 36	7 18
144	**24**	M	4 36	7 19
145	**25**	Tu	4 35	7 20
146	**26**	W	4 34	7 20
147	**27**	Th	4 34	7 21
148	**28**	F	4 33	7 22
149	**29**	Sa	4 32	7 23
150	**30**	☉	4 32	7 23
151	**31**	M	4 31	7 24

Moon's Phases.

New M., May 1, 3 h. 46 m., eve.
First Q., May 9, 4 h. 37 m., eve.
Full M., May 16, 8 h. 54 m., morn.
Last Q., May 23, 4 h. 34 m., morn.
New M., May 31, 7 h. 25 m., morn.

JUNE, 1897.

6th MONTH. 30 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
152	**1**	Tu	4 31	7 24
153	**2**	W	4 30	7 25
154	**3**	Th	4 30	7 26
155	**4**	F	4 30	7 26
156	**5**	Sa	4 29	7 27
157	**6**	☉	4 29	7 28
158	**7**	M	4 29	7 28
159	**8**	Tu	4 29	7 29
160	**9**	W	4 28	7 30
161	**10**	Th	4 28	7 30
162	**11**	F	4 28	7 31
163	**12**	Sa	4 28	7 31
164	**13**	☉	4 28	7 32
165	**14**	M	4 28	7 32
166	**15**	Tu	4 28	7 32
167	**16**	W	4 28	7 33
168	**17**	Th	4 28	7 33
169	**18**	F	4 28	7 33
170	**19**	Sa	4 28	7 34
171	**20**	☉	4 29	7 34
172	**21**	M	4 29	7 34
173	**22**	Tu	4 29	7 34
174	**23**	W	4 29	7 34
175	**24**	Th	4 29	7 34
176	**25**	F	4 30	7 35
177	**26**	Sa	4 30	7 35
178	**27**	☉	4 30	7 35
179	**28**	M	4 31	7 35
180	**29**	Tu	4 31	7 35
181	**30**	W	4 32	7 35

Moon's Phases.

First Q., June 8, 2 h. 2 m., morn.
Full M., June 14, 4 h. 1 m., eve.
Last Q., June 21, 6 h. 24 m., eve.
New M., June 29, 9 h. 55 m., eve.

JULY, 1897.

7th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
182	**1**	Th	4 32	7 35
183	**2**	F	4 32	7 35
184	**3**	Sa	4 33	7 34
185	**4**	☉	4 33	7 34
186	**5**	M	4 34	7 34
187	**6**	Tu	4 35	7 34
188	**7**	W	4 35	7 33
189	**8**	Th	4 36	7 33
190	**9.**	F	4 37	7 33
191	**10**	Sa	4 37	7 32
192	**11**	☉	4 38	7 32
193	**12**	M	4 39	7 31
194	**13**	Tu	4 39	7 31
195	**14**	W	4 40	7 30
196	**15**	Th	4 41	7 30
197	**16**	F	4 42	7 29
198	**17**	Sa	4 43	7 29
199	**18**	☉	4 44	7 28
200	**19**	M	4 44	7 27
201	**20**	Tu	4 45	7 26
202	**21**	W	4 46	7 26
203	**22**	Th	4 47	7 25
204	**23**	F	4 48	7 24
205	**24**	Sa	4 48	7 23
206	**25**	☉	4 49	7 23
207	**26**	M	4 50	7 22
208	**27**	Tu	4 51	7 21
209	**28**	W	4 52	7 20
210	**29**	Th	4 53	7 19
211	**30**	F	4 54	7 18
212	**31**	Sa	4 55	7 17

Moon's Phases.

First Q., July 7, 8 h. 32 m., morn.
Full M., July 13, 11 h. 52 m., eve.
Last Q., July 21, 10 h. 8 m., morn.
New M., July 29, 10 h. 58 m., morn.

AUGUST, 1897.

8th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
213	**1**	☉	4 56	7 16
214	**2**	M	4 57	7 14
215	**3**	Tu	4 58	7 13
216	**4**	W	4 59	7 12
217	**5**	Th	5 00	7 11
218	**6**	F	5 01	7 10
219	**7**	Sa	5 02	7 09
220	**8**	☉	5 03	7 07
221	**9**	M	5 04	7 06
222	**10**	Tu	5 05	7 05
223	**11**	W	5 06	7 04
224	**12**	Th	5 07	7 02
225	**13**	F	5 08	7 01
226	**14**	Sa	5 09	7 00
227	**15**	☉	5 10	6 58
228	**16**	M	5 11	6 57
229	**17**	Tu	5 12	6 55
230	**18**	W	5 13	6 54
231	**19**	Th	5 14	6 53
232	**20**	F	5 15	6 51
233	**21**	Sa	5 16	6 50
234	**22**	☉	5 17	6 48
235	**23**	M	5 17	6 47
236	**24**	Tu	5 18	6 45
237	**25**	W	5 19	6 44
238	**26**	Th	5 20	6 42
239	**27**	F	5 21	6 41
240	**28**	Sa	5 22	6 39
241	**29**	☉	5 23	6 37
242	**30**	M	5 24	6 36
243	**31**	Tu	5 25	6 34

Moon's Phases.

First Q., Aug. 5, 1 h. 24 m., eve.
Full M., Aug. 12, 9 h. 22 m., morn.
Last Q., Aug. 20, 3 h , 29 m., morn.
New M., Aug. 27, 10 h. 29 m., eve.

SEPTEMBER, 1897.

9th MONTH. 30 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	Sun sets. H. M.
244	**1**	W	5 26	6 33
245	**2**	Th	5 27	6 31
246	**3**	F	5 28	6 29
247	**4**	Sa	5 29	6 28
248	**5**	☉	5 30	6 26
249	**6**	M	5 31	6 25
250	**7**	Tu	5 32	6 23
251	**8**	W	5 33	6 21
252	**9**	Th	5 34	6 20
253	**10**	F	5 35	6 18
254	**11**	Sa	5 36	6 16
255	**12**	☉	5 37	6 15
256	**13**	M	5 38	6 13
257	**14**	Tu	5 39	6 11
258	**15**	W	5 40	6 09
259	**16**	Th	5 41	6 08
260	**17**	F	5 42	6 06
261	**18**	Sa	5 43	6 04
262	**19**	☉	5 44	6 03
263	**20**	M	5 45	6 01
264	**21**	Tu	5 46	5 59
265	**22**	W	5 47	5 58
266	**23**	Th	5 48	5 56
267	**24**	F	5 49	5 55
268	**25**	Sa	5 50	5 53
269	**26**	☉	5 51	5 52
270	**27**	M	5 52	5 50
271	**28**	Tu	5 53	5 48
272	**29**	W	5 54	5 46
273	**30**	Th	5 54	5 44

Moon's Phases.

First Q., Sept. 3, 6 h. 13 m., eve.
Full M., Sept. 10, 9 h. 12 m., eve.
Last Q., Sept. 18, 9 h. 51 m., eve.
New M., Sept. 26, 8 h. 46 m., morn.

OCTOBER, 1897.

10th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	Sun sets. H. M.
274	**1**	F	5 56	5 43
275	**2**	Sa	5 57	5 41
276	**3**	☉	5 58	5 39
277	**4**	M	5 59	5 38
278	**5**	Tu	6 00	5 36
279	**6**	W	6 01	5 35
280	**7**	Th	6 02	5 33
281	**8**	F	6 03	5 31
282	**9**	Sa	6 04	5 30
283	**10**	☉	6 05	5 28
284	**11**	M	6 07	5 27
285	**12**	Tu	6 08	5 25
286	**13**	W	6 09	5 23
287	**14**	Th	6 10	5 22
288	**15**	F	6 11	5 20
289	**16**	Sa	6 12	5 19
290	**17**	☉	6 13	5 17
291	**18**	M	6 14	5 16
292	**19**	Tu	6 15	5 14
293	**20**	W	6 16	5 13
294	**21**	Th	6 18	5 12
295	**22**	F	6 19	5 10
296	**23**	Sa	6 20	5 09
297	**24**	☉	6 21	5 07
298	**25**	M	6 22	5 06
299	**26**	Tu	6 23	5 04
300	**27**	W	6 24	5 03
301	**28**	Th	6 26	5 02
302	**29**	F	6 27	5 01
303	**30**	Sa	6 28	4 59
304	**31**	☉	6 29	4 58

Moon's Phases.

First Q., Oct. 3, 0 h. 31 m., morn.
Full M., Oct. 10, 11 h. 42 m., morn.
Last Q., Oct. 18, 4 h. 9 m., eve.
New M., Oct. 25, 6 h. 28 m., eve.

NOVEMBER, 1897.

11th MONTH. 30 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	Sun sets. H. M.
305	**1**	M	6 30	4 57
306	**2**	Tu	6 31	4 56
307	**3**	W	6 32	4 54
308	**4**	Th	6 34	4 53
309	**5**	F	6 35	4 52
310	**6**	Sa	6 36	4 51
311	**7**	☉	6 37	4 50
312	**8**	M	6 38	4 49
313	**9**	Tu	6 40	4 48
314	**10**	W	6 41	4 47
315	**11**	Th	6 42	4 46
316	**12**	F	6 43	4 45
317	**13**	Sa	6 44	4 44
318	**14**	☉	6 46	4 43
319	**15**	M	6 47	4 42
320	**16**	Tu	6 48	4 41
321	**17**	W	6 49	4 40
322	**18**	Th	6 50	4 39
323	**19**	F	6 51	4 39
324	**20**	Sa	6 53	4 38
325	**21**	☉	6 54	4 38
326	**22**	M	6 55	4 37
327	**23**	Tu	6 56	4 36
328	**24**	W	6 57	4 36
329	**25**	Th	6 58	4 35
330	**26**	F	6 59	4 35
331	**27**	Sa	7 00	4 35
332	**28**	☉	7 02	4 34
333	**29**	M	7 03	4 34
334	**30**	Tu	7 04	4 34

Moon's Phases.

First Q., Nov. 1, 9 h. 37 m., morn.
Full M., Nov. 9, 4 h. 50 m., morn.
Last Q., Nov. 17, 9 h. 2 m., morn.
New M., Nov. 24, 4 h. 20 m., morn.
First Q., Nov. 30, 10 h. 14 m , eve.

DECEMBER, 1897.

12th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	Sun sets. H. M.
335	**1**	W	7 05	4 34
336	**2**	Th	7 06	4 33
337	**3**	F	7 07	4 33
338	**4**	Sa	7 08	4 33
339	**5**	☉	7 09	4 32
340	**6**	M	7 10	4 32
341	**7**	Tu	7 11	4 32
342	**8**	W	7 12	4 32
343	**9**	Th	7 13	4 32
344	**10**	F	7 14	4 32
345	**11**	Sa	7 15	4 32
346	**12**	☉	7 15	4 32
347	**13**	M	7 16	4 33
348	**14**	Tu	7 16	4 33
349	**15**	W	7 17	4 33
350	**16**	Th	7 18	4 33
351	**17**	F	7 18	4 33
352	**18**	Sa	7 19	4 34
353	**19**	☉	7 20	4 34
354	**20**	M	7 20	4 35
355	**21**	Tu	7 21	4 35
356	**22**	W	7 21	4 36
357	**23**	Th	7 22	4 37
358	**24**	F	7 22	4 37
359	**25**	Sa	7 23	4 38
360	**26**	☉	7 23	4 39
361	**27**	M	7 23	4 39
362	**28**	Tu	7 23	4 40
363	**29**	W	7 24	4 40
364	**30**	Th	7 24	4 41
365	**31**	F	7 24	4 42

Moon's Phases.

Full M., Dec. 8, 11 h., 54 m., eve.
Last Q., Dec. 16, 11 h. 22 m., eve.
New M., Dec. 23, 2 h., 55 m., eve.
First Q., Dec. 30, 2 h. 27 m., eve.

REFERENCE CALENDAR FOR THREE YEARS.

1896

	S	M	T	W	T	F	S
Jan.	..	..	..	1	2	3	4
	5	6	7	8	9	10	11
	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
	26	27	28	29	30	31	..
Feb.	..	..	..	..	..	..	1
	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	29
Mar.	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31	..	..	..	..
April	..	..	..	1	2	3	4
	5	6	7	8	9	10	11
	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
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	17	18	19	20	21	22	23
	24	25	26	27	28	29	30
	31	..	..	..	..	..	..
June	..	1	2	3	4	5	6
	7	8	9	10	11	12	13
	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28	29	30	..	..	..	..
July	..	..	..	1	2	3	4
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	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
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Aug.	2	3	4	5	6	7	8
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	30	31	..	..	..	..	..

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	27	28	29	30	..	..	..
Oct.	..	..	..	..	1	2	3
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	18	19	20	21	22	23	24
	25	26	27	28	29	30	31
Nov.	1	2	3	4	5	6	7
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	22	23	24	25	26	27	28
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Dec.	..	..	1	2	3	4	5
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1897

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	31	..	..	..	..	..	..
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	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28	..	..	..	..	..	..
Mar.	..	1	2	3	4	5	6
	7	8	9	10	11	12	13
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	28	29	30	31	..	..	..
April	..	..	..	..	1	2	3
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	23	24	25	26	27	28	29
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June	..	..	1	2	3	4	5
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	20	21	22	23	24	25	26
	27	28	29	30	..	..	..
July	..	..	..	..	1	2	3
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	11	12	13	14	15	16	17
	18	19	20	21	22	23	24
	25	26	27	28	29	30	31
Aug.	1	2	3	4	5	6	7
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	24	25	26	27	28	29	30
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Nov.	..	1	2	3	4	5	6
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	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28	29	30	..	..	..	..
Dec.	..	..	..	..	..	..	1
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	16	17	18	19	20	21	22
	23	24	25	26	27	28	29
	30	31	..	..	..	..	..

1898

	S	M	T	W	T	F	S
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	23	24	25	26	27	28	29
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Feb.	..	..	1	2	3	4	5
	6	7	8	9	10	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	..	..	..	..	..
Mar.	..	..	1	2	3	4	5
	6	7	8	9	10	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	29	30	31	..	..
April	..	..	..	..	..	1	2
	3	4	5	6	7	8	9
	10	11	12	13	14	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30

	S	M	T	W	T	F	S
May	1	2	3	4	5	6	7
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	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31	..	..	..	..
June	..	..	..	1	2	3	4
	5	6	7	8	9	10	11
	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
	26	27	28	29	30	..	..
July	..	..	..	..	..	1	2
	3	4	5	6	7	8	9
	10	11	12	13	14	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30
	31	..	..	..	..	..	..
Aug.	..	1	2	3	4	5	6
	7	8	9	10	11	12	13
	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28	29	30	31	..	..	..

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	25	26	27	28	29	30	..
Oct.	..	..	..	..	..	..	1
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	16	17	18	19	20	21	22
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Nov.	..	..	1	2	3	4	5
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	20	21	22	23	24	25	26
	27	28	29	30	..	..	..
Dec.	..	..	..	..	1	2	3
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	18	19	20	21	22	23	24
	25	26	27	28	29	30	31

ECLIPSES IN 1897.

NOTE.—*Local mean time for the latitude of New York City is used in reckoning eclipses, sunset and sunrise. Subtract four minutes to change the reckoning to Eastern standard time of 75th meridian.*

Moon's phases are calculated for Eastern standard time. "Morn." is understood to extend from Midnight to Noon; "Eve." from Noon to Midnight.

There will be two Eclipses this year, both of the Sun, as follows:

I.—*An annular eclipse of the Sun*, February 1, visible in the Southern and Atlantic States about sunset, as a small partial eclipse upon the sun's southern limb.

II.—*An annular eclipse of the Sun*, July 29, visible throughout the United States as a large partial eclipse upon the sun's southern limb. Beginning at Washington at 8.44 morn.; greatest eclipse (6½ digits), 9.54 morn.; ends 11.5 morn. On the Pacific coast the eclipse will occur near sunset.

THE SEASONS.

SPRING begins	March 20, 3 p.m.	AUTUMN begins	September 23, 2 a.m.
SUMMER begins	June 21, noon.	WINTER begins	December 21, 9 p.m.

CHURCH DAYS.

Septuagesima	Feb. 14	Easter Sunday	April 18	Dominical Letter	C
Sexagesima	Feb. 21	Low Sunday	April 25	Epact	26
Quinquagesima	Feb. 28	Rogation Sunday	May 23	Golden Number	17
Shrove Tuesday	March 2	Ascension Day	May 27	Solar Cycle	2
Ash Wednesday	March 3	Whitsunday (Pent.)	June 6	Roman Indiction	10
Quadragesima	March 7	Trinity Sunday	June 13	Julian Period	6610
Palm Sunday	April 11	Corpus Christi	June 17	Jewish Lunar Cycle	14
Good Friday	April 16	Advent Sunday	Nov. 28	Dionysian Period	226

CHRONOLOGICAL CYCLES.

CHRONOLOGICAL ERAS.

The year 1897, which comprises the latter part of the 121st and the first part of the 122d year of the INDEPENDENCE OF THE UNITED STATES OF AMERICA, corresponds to the year 6610 of the JULIAN PERIOD; the year 7405-7406 of the BYZANTINE ERA; the year 5657-58 of the JEWISH ERA; the year 2650 since the FOUNDATION OF ROME, according to Varro; the year 2673 of the OLYMPIADS; the year 1613 of the era of DIOCLETIAN; the year 2557 of the JAPANESE ERA; the year 1314-15 of the MOHAMMEDAN ERA.

The 1st day of January of the year 1897 is the 2,413,926th day since the commencement of the JULIAN PERIOD.

The JULIAN CALENDAR, which is still used in the Russian Empire, dates twelve days back of our own—the GREGORIAN CALENDAR. Thus a letter from St. Petersburg dated January 1st was really written on January 13th.

The Russians generally use, in official documents and frequently in business correspondence, two dates, which they call "old style" and "new style"; and in Alaska three dates have been used on their documents, because the early navigators forgot to make allowance for the crossing of the 180th meridian in sailing from Siberia to North America.

LEGAL HOLIDAYS IN THE VARIOUS STATES.

JAN. 1. NEW YEAR'S DAY: In all States except Massachusetts, New Hampshire and Rhode Island.

JAN. 8. ANNIVERSARY OF THE BATTLE OF NEW ORLEANS: In Louisiana.

JAN. 19. LEE'S BIRTHDAY: In Georgia, North Carolina and Virginia.

FEB. 12. LINCOLN'S BIRTHDAY: In all States.

FEB. 22. WASHINGTON'S BIRTHDAY: In all States except Arkansas, Iowa and Mississippi

FEB. 20 MARDI-GRAS: In Alabama and Louisiana.

MARCH 2. ANNIVERSARY OF TEXAN INDEPENDENCE: In Texas.

MARCH 4. FIREMEN'S ANNIVERSARY: In New Orleans, La.

APRIL 3. GOOD FRIDAY: In Alabama, Louisiana, Maryland, Pennsylvania and Tennessee.

APRIL 19. PATRIOTS' DAY: In Massachusetts.

APRIL 21. ANNIVERSARY OF THE BATTLE OF SAN JACINTO: In Texas.

APRIL 26. MEMORIAL DAY: In Alabama and Georgia.

MAY 10. MEMORIAL DAY: In North Carolina.

MAY 20. ANNIVERSARY OF THE SIGNING OF THE MECKLENBURG DECLARATION OF INDEPENDENCE: in North Carolina.

MAY 30 DECORATION DAY: In Arizona, California, Colorado, Connecticut, Delaware District of Columbia, Iowa, Illinois, Indiana, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New York, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Tennessee, Utah, Vermont, Wisconsin, Washington and Wyoming.

JUNE 3. JEFFERSON DAVIS'S BIRTHDAY: In Florida

JUNE 17. BATTLE OF BUNKER HILL: In Boston, Mass.

JULY 4. INDEPENDENCE DAY: In all States.

JULY 24. PIONEERS' DAY: In Utah.

SEPT. 7. LABOR DAY: In Alabama, California, Colorado, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Montana, Nebraska, New Hampshire, New Jersey, New York,

Ohio, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia and Washington.

SEPT. 9. ADMISSION DAY: In California.

SEPT. 12. LABOR DAY: In Florida

OCT. 31. ADMISSION DAY: In Nevada.

NOV. 3. GENERAL ELECTION DAY: In Arizona, California, Idaho, Indiana, Kansas, Maryland, Minnesota, Missouri, Montana, Nevada, New Hampshire, New Jersey, New York, North Dakota, Ohio, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, West Virginia, Washington, Wisconsin and Wyoming.

NOV. 25. LABOR DAY: In Louisiana.

NOV. 26. THANKSGIVING DAY: In all States, though in some it is not a statutory holiday.

DEC 25. CHRISTMAS DAY. In all States; in South Carolina, the two succeeding days in addition.

SUNDAYS AND FAST DAYS are legal holidays in all States, which designate them as such.

ARBOR DAY is a legal holiday in Kansas, North Dakota, Rhode Island and Wyoming, the day being set by the Governor—in Nebraska, April 22; California, September 9; Colorado, third Friday in April; Montana, third Tuesday in April; Utah, first Saturday in April: Idaho, Friday after May 1.

EVERY SATURDAY after 12o'clock noon is a legal holiday in New York, New Jersey, New Orleans, Pennsylvania and Maryland; and from June 1 to September 30 in New Castle Co., Del.

THERE are no national holidays, not even the Fourth of July. Congress has at various times appointed special holidays. In the second session of the Fifty-third Congress, it passed an act making Labor Day a public holiday in the District of Columbia; and it has recognized the existence of certain days as holidays, for commercial purposes, in such legislation as the Bankruptcy act, but with the exception named, there is no general statute on the subject. The proclamation of the President designating a day of thanksgiving only, makes it a holiday in those States which provide by law for it.

UNITED STATES AND TERRITORIES.

States and Territories.	Estimated Populat'n.	Capitals.	States and Territories.	Estimated Populat'n.	Capitals.
Alabama	1,600,000	Montgomery.	Montana	185,000	Helena.
Alaska Terr	31,000	Sitka.	Nebraska	1,158,000	Lincoln.
Arizona Terr	77,000	Phœnix.	Nevada	60,000	Carson City.
Arkansas	1,600,000	Little Rock.	New Hampshire.	400,000	Concord.
California	1,220,000	Sacramento.	New Jersey	1,672,942	Trenton.
Colorado	450,000	Denver.	New Mexico T.	185,000	Santa Fé.
Connecticut	800,000	Hartford.	New York	6,690,842	Albany.
Delaware	179,700	Dover.	North Carolina	1,720,000	Raleigh.
Dist. Columbia	270,519	Washington.	North Dakota	225,000	Bismark.
Florida	485.000	Tallahassee.	Ohio	4.000,000	Columbus.
Georgia	1,984,939	Atlanta.	Oklahoma Terr.	275,000	Guthrie.
Idaho	130,000	Boise City.	Oregon	400,000	Salem
Illinois	4,500,000	Springfield.	Pennsylvania	5,760,128	Harrisburg.
Indiana	3,135,360	Indianapolis.	Rhode Island	384,758	Providence.
Iowa	2,000,000	Des Moines	South Carolina	1,375.000	Columbia.
Kansas	1,350,000	Topeka.	South Dakota	332,000	Pierre.
Kentucky	2,200,000	Frankfort.	Tennessee	1,800.000	Nashville.
Louisiana	1,225,000	Baton Rouge.	Texas	2,838,263	Austin.
Maine	732,000	Augusta.	Utah Terr	254,743	Salt Lake City.
Maryland	1.138,348	Annapolis	Vermont	340,000	Montpelier.
Massachusetts	2,495,345	Boston.	Virginia	1,750 000	Richmond.
Michigan	2,297,000	Lansing.	Washington	415,000	Olympia.
Minnesota	1,610,000	St. Paul.	West Virginia	875,000	Charleston.
Mississippi	1,351,850	Jackson.	Wisconsin	1,937,915	Madison.
Missouri	3,200,000	Jefferson City.	Wyoming	100,000	Cheyenne.

Grand Total, January, 1896 71,197,652

DIFFERENCE IN TIME (FOR CABLE PURPOSES),

BETWEEN THE CITY OF NEW YORK AND THE PRINCIPAL FOREIGN CITIES.

LATER THAN NEW YORK.						EARLIER THAN NEW YORK.	
	H. M.		H.M		H.M.		H.M.
Antwerp	5 13.5	Dublin	4 30.5	Rio de Janeiro.	2 3.2	Havanna	0 33.5
Berlin	5 49.5	Edinburgh	4 43.2	Rome	5 45.8	Hong Kong	11 27.4
Bremen	5 31.0	Geneva	5 20.5	St. Petersburg	6 57.1	Melbourne	9 24.2
Brussels	5 13.4	Hamburg	5 35.8	Valparaiso	0 9.3	Mexico City of	1 40.5
Buenos Ayres	1 2.4	Liverpool	4 43.6	Vienna	6 1.2	Panama	0 22.2
Calcutta	11 49.2	London	4 55.9	Halifax	0 41.5	Yokohama	9 45.5
Constantinople	6 51.9	Madrid	4 41.1				
		Paris	5 5.2				



"MENDING THE NETS."
By ALFRED STIEGLITZ.

The American Annual of Photography and Photographic Times Almanac for 1897

THE HAND CAMERA—ITS PRESENT IMPORTANCE.

BY ALFRED STIEGLITZ.

(With illustrations by the Author.)



"WINTER, FIFTH AVENUE." By A. S.

PHOTOGRAPHY as a fad is well-nigh on its last legs, thanks principally to the bicycle craze. Those seriously interested in its advancement do not look upon this state of affairs as a misfortune, but as a disguised blessing, inasmuch as photography had been classed as a sport by nearly all of those who deserted its ranks and fled to the present idol, the bicycle. The only persons who seem to look upon this turn of affairs as entirely unwelcome are those engaged in manufacturing and selling photographic goods. It was, undoubtedly, due to the hand camera that photography became so generally popular a few years ago. Every Tom, Dick and Harry could, without trouble, learn how to get something or other on a sensitive plate, and this is what the public wanted—no work and lots of fun.



"WASH-DAY," VENICE. By A. S.

Thanks to the efforts of these persons hand camera and bad work became synonymous. The climax was reached when an enterprising firm flooded the market with a very ingenious hand camera and the announcement, "You press the button, and we do the rest." This was the beginning of the "photographing-by-the-yard" era, and the ranks of enthusiastic Button Pressers were enlarged to enormous dimensions. The hand camera ruled supreme.

Originally known under the odious name of "Detective," necessarily insinuating the owner to be somewhat of a sneak, the hand camera was in very bad repute with all the champions of the tripod. They looked upon the small instrument, innocent enough in itself, but terrible in the hands of the unknowing, as a mere toy, good for the purposes of the globe-trotter, who wished to jot down photographic notes



"A BLOCKADE," NEW YORK. By A. S.

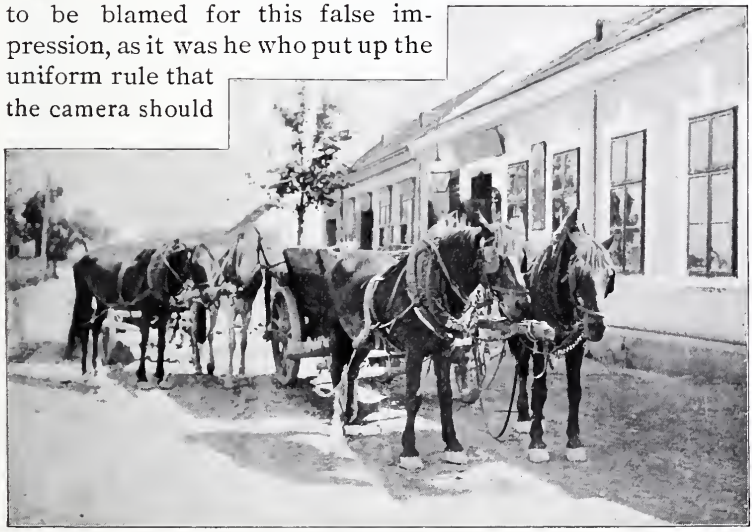


A VENETIAN SILHOUETTE. By A. S.

as he passed along his journey, but in no way adapted to the wants of him whose aim it is to do serious work.

But in the past year or two all this has been changed. There are many who claim that for just the most serious work the hand camera is not only excellently adapted, but that without it the pictorial photographer is sadly handicapped.

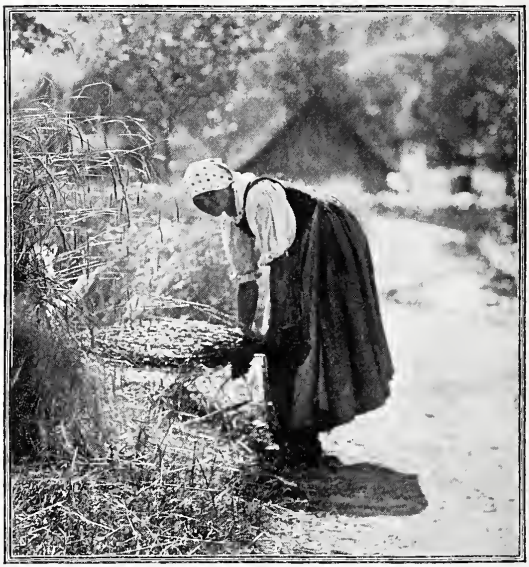
The writer is amongst the advocates who cannot too strongly recommend the trial of the hand camera for this class of photography. He frankly confesses that for many years he belonged to that class which opposed its use for picture making. This was due to a prejudice which found its cause in the fact that the impression had been given him that for hand camera exposures strong sunlight was *sina qua non*. The manufacturer is chiefly to be blamed for this false impression, as it was he who put up the uniform rule that the camera should



"A HOT DAY." By A. S.

be held in such a position that the sunlight comes from over one of the shoulders, in order to insure such lighting as to fully expose the plate. In short, the manufacturer himself did not realize the possibilities of his own ware and invention.

In preparing for hand camera work, the choice of the instrument is of vital importance. Upon this subject that able artist, J. Craig Annan, of Glasgow, who does much of his work with the hand camera, says: "Having secured a light-tight camera and suitable lens, there is no more important quality than ease in mechanical working. The adjustments ought to be so simple that the operator may be able to bring it from his satchel and get it in order for making an exposure without a conscious thought. Each worker will have his own idea as to which style of camera comes nearest to perfection in this respect, and having made his choice he should study to become so intimate with it that it will become a second nature with his hands to prepare the camera while his mind and eyes are fully occupied with the subject before him."



"FROM THE FIELDS." By A. S.

To this let me add, that whatever camera may be chosen let it be waterproof, so as to permit photographing in rain or shine without damage to the box. The writer does not approve of complicated mechanisms, as they are sure to get



A VENETIAN WELL. By A. S.



AT MID-OCEAN. By A. S.

out of order at important moments, thus causing considerable unnecessary swearing, and often the loss of a precious opportunity. My own camera is of the simplest pattern and has never left me in the lurch, although it has had some very tough handling in wind and storm. The reliability of the shutter is of greater importance than its speed. As race-horse scenes, express trains, etc., are rarely wanted in pictures, a shutter working at a speed of one-fourth to one-twenty-fifth of a second will answer all purposes. Microscopic sharpness is of no pictorial value. A little blurr in a moving subject will often aid in giving the impression of action and motion.

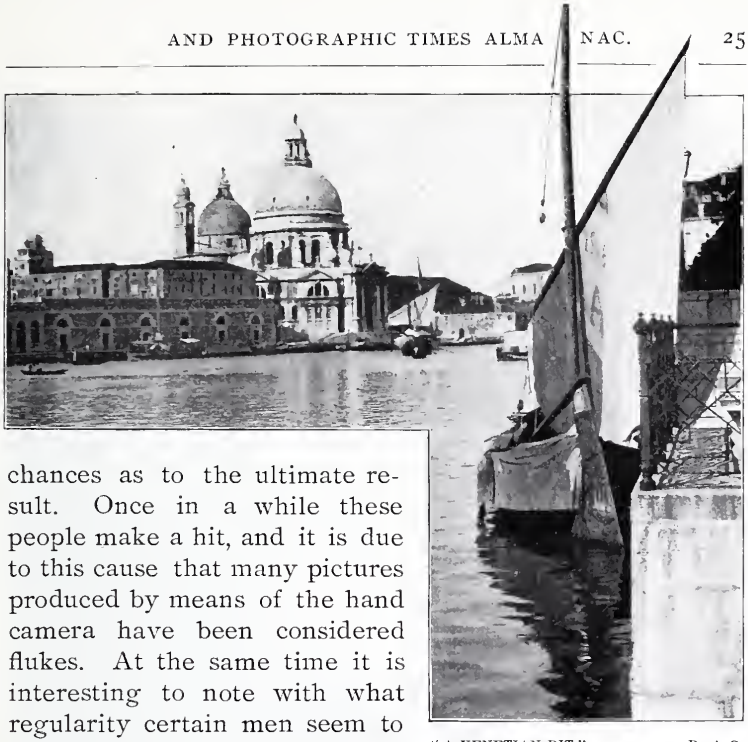
As for plates, use the fastest you can get. They cannot be too fast. Do not stop down your lens except at the seashore, and set your shutter at as slow speed as the subject will permit. This will ensure a fully exposed plate. Under exposures are best relegated to the ash-barrel, as they are useless for pictorial work.

The one quality absolutely necessary for success in hand camera work is *Patience.*

This is really the keynote to the whole matter. It is amusing to watch the majority of hand camera workers shooting off a ton of plates helter-skelter, taking their



"KATWYK BEACH." By A. S.



"A VENETIAN BIT." By A. S.

chances as to the ultimate result. Once in a while these people make a hit, and it is due to this cause that many pictures produced by means of the hand camera have been considered flukes. At the same time it is interesting to note with what regularity certain men seem to be the favorites of chance—so that it would lead us to conclude that, perhaps, chance is not everything, after all.

In order to obtain pictures by means of the hand camera it is well to choose your subject, regardless of figures, and carefully study the lines and lighting. After having determined upon these watch the passing figures and await the moment in which everything is in balance; that is, satisfies your eye. This often means hours of patient waiting. My picture, "Fifth Avenue, Winter," is the result of a three hours' stand during a fierce snow-storm on February 22d, 1893, awaiting the proper moment. My patience was duly rewarded. Of course, the result contained an element of chance, as I might have stood there for hours without succeeding in getting the desired picture. I remember how upon having developed the negative of the picture I showed it to some of my colleagues. They smiled and advised me to throw away such rot. "Why, it isn't even sharp, and he

wants to use it for an enlargement!" Such were the remarks made about what I knew was a pieee of work quite out of the ordinary, in that it was the first attempt at picture making with the hand camera in such adverse and trying circumstances from a photographie point of view. Some time later the laugh was on the other side, for when the finished picture was shown to these same gentlemen it proved to them conclusively that there was other photographie work open to them during the "bad season" than that so fully set forth in the photographie journals under the heading, "Work for the Winter Months." This incident also goes to prove that the making of the negative alone is not the



VENETIAN CHARACTERS. By A. S.



"GOSSIP." By A. S.

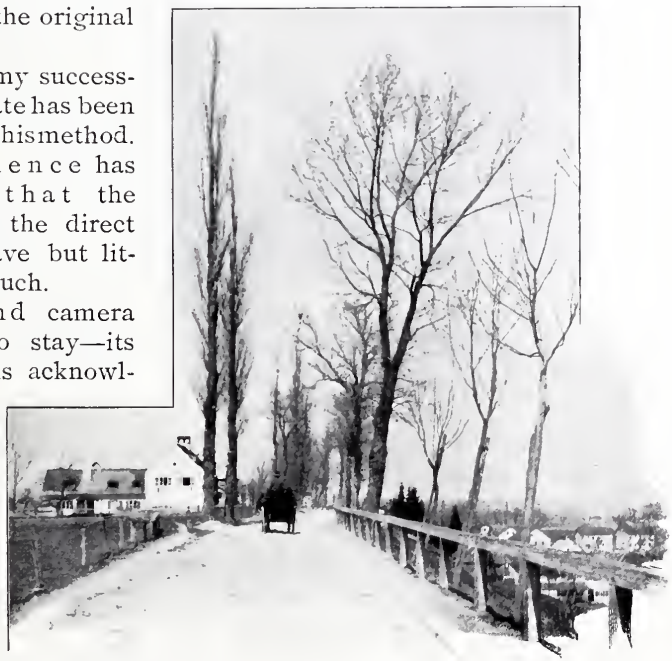
making of the picture. My hand camera negatives are all made with the express purpose of enlargement, and it is but rarely that I use more than part of the original shot.

Most of my successful work of late has been produced by this method. My experience has taught me that the prints from the direct negatives have but little value as such.

The hand camera has come to stay—its importance is acknowledged.

A word to the wise is sufficient.

In justice to the author we feel compelled to state that the reproductions of his illustrations give no idea of the originals.



A BIT NEAR MUNICH. By A. S.

A CHECKER BOARD.

BY R. R. BOURLAND.



"CURIOSITY." By J. M. C. GROVE.

SOME two years ago in the columns of the *Photographic Times* there appeared a list of various articles the amateur photographer might make, using principally his pet art in the process. The list was quite long, and the one item which made a lasting impression upon *us* (my wife and me) was "Checker Board." There was no detailed instruction nor suggestion as to *how* to make it, there was nothing but an *Idea* to build on.

The following Christmas time, while planning our gifts and cogitating how we might make photography go the farthest in aiding to make up for lack ot unlimited resources of wealth, the *Idea* blossomed as we remembered some of our checker-playing friends. *Some* one had made a Photographic Checker Board—*we* would do it; but how could we? We objected to the use of a camera small enough to make pictures 1¾ inches square and it seemed that *fractional* pictures would be only *fractured* pictures, and therein lay our mistake.

It occurred to us that Mr. Hope, in his "Amateur Photography" had said, under "Trimming," "Don't fear to

cut the edges down. . . . You will seldom hurt your pictures by cutting them down." We thought to try this method, and were surprized to find how many of our negatives produced small "bits" surrounded by a surplus of extraneous matter. Hence, we proceeded to try our scraps of unmounted prints by applying a glass pattern 1¾ inches square to the



A PHOTOGRAPHIC CHECKER BOARD.

prints, moving it to get best effect, and were truly pleased with the result, and to find that the "gist" of *many* of our 4 x 5 and *some* of our 5 x 7 negatives lay in the small space covered by the pattern. So we hunted through our negatives and found over one hundred in the old boxes which would do to cut down to this extent, and from them made

prints enough to make several checker boards, in which the black squares were replaced by photographs selected as appropriate and acceptable to the person who was about to receive the gift. The size of the squares (as stated) was chosen to be 1¾ inches, making the center of the board 14 inches square. The paper chosen was aristo-platino to get the clear black and white effect and matt surface. The paper was carefully cut to size before printing, great pains taken to print evenly, and all the prints for each board toned at one time in order to avoid variation. As a general thing, white sky surfaces are to be avoided to maintain a *dark* effect for the whole square, as far as consistent and possible.

The two ends (or sides) of the board are *each* considered to be the bottom of the picture, so four rows are mounted one way and four rows turned just the opposite, thus each player has the bottom of his four rows of pictures towards him, and he sees them "right."

The paper chosen for mounting was the heaviest Bristol board, stiffened by being itself mounted on the heaviest straw board; a margin of 3 inches is preserved, making the whole board 20 inches square. A line border (very simple) is ruled in india-ink, and a fine trace in red ink around each white square (⅛ inch inside of boundary of the square) sets the board off very well.

This finishes the strictly amateur part of the work. The board is now turned over to the framer of pictures, who is instructed to select *fine*, *clear* and *heavy* glass for a cover, and a *deep*, *narrow plain* bead moulding of oak for a frame like this (Fig. 1).



FIG. 1.

A. Shows the bead moulding.

1. Is the glass cover.

2. The mounted prints.

3. A filling "built up" of pulp or straw boards to give stiffness to, and allow a depth of moulding for strength.

4. The final finish of green billiard cloth or felt cloth back covering, to make it noiseless on a table.



STUDY FOR A PICTURE.

BY ALFRED STIEGLITZ.

Never before did we succeed so well in pleasing our friends with their Christmas. The matter of selection of pictures with reference to the *personality*, tastes, and relationship of the person who is to receive the gift, is very worthy of attention, for instance: to our friend with a Jersey farm, we put in several views taken on his farm, and showing his own stock; for our relatives near in kinship, but far in distance, we scattered in some of our own portraits (and those of our children) and views of, and around our home.

For our artistic friend we chose dainty landscapes.

In these we did not confine ourselves to our own negatives, but selected those available among our amateur friends.

In the one accompanying this article, however, we have not plagiarized and are responsible for all its faults and defects.

DEVELOPING FILMS.

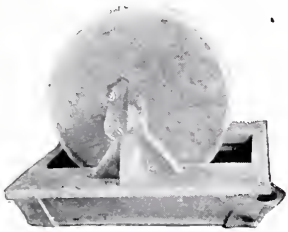
BY. A. S. MURRAY.

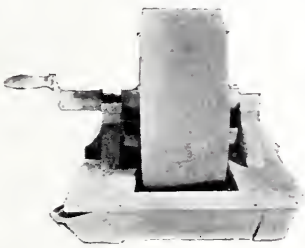


Copyright 1896. By J. SCHLOSS.

IF the piece of apparatus which is here described is employed, the objection which the average amateur may urge against the use of films, can be obviated and the development of them made easy. I have used a great many of the pocket variety, and as I develop myself all the exposures I ever make, I found the work tedious and uncertain, viz: that of handling them after cutting them apart. I then devised the following described mode of handling them. Have a wooden drum made 9¼ inches in diameter with

4 inches of face. Make cover for pan (8 x 10) to act as a support for the drum to revolve on an axle, fitted with a crank. Place at intervals of one-quarter of an inch apart short pin points, the line of them being parallel to the axis of the drum. Have two pegs of wood placed in the sides of the drum, and about one-half an inch from the edge. Having taken the film from its paper support, fasten one end on the row of pin points, and revolve the drum until the two ends meet, and is pressed all the way down to the face of the drum; they are then held in position, by a rubber band caught on the peg on one side, stretched across the face of the drum, and on top at the two ends of the films fastened to the pin points, and placed over the peg on the opposite side. A sufficient quantity of a slow developer is placed in the pan, to allow the drum to revolve about one-quarter of an inch below its surface. Remove slowly and smoothly. After some little experience one will develop the exposures to proper density and uniformity. The size given for the drum is suited to the length of the films employed in the pocket Kodak, and should other lengths be used to be sure a larger drum is necessary, or the film can be cut into two or more pieces. Before using, the drum must be coated with a solution of paraffin in benzine; this will make it waterproof.







ENTRANCE TO BUFFALO HARBOR. BY C. L. BAER.

HOW TO MAKE A CHEAP FOCUSING GLASS.

BY J. R. SWAIN.



THE DIVER. By LOUIS MELDON.

FROM any optician procure a 3 inch focus convex lens, 1 inch in diameter, round like a dollar. Take this to a tin-shop and have made a tin or brass cylinder 1 inch in diameter and 3 inches long, open at both ends. Now one-half inch from one end of the cylinder solder a small ring the size of the inside of the cylinder. This is for the lens to rest against. Insert the lens and fasten with another ring held in position by friction against the side of the cylinder. This is for convenience in removing the lens to be cleaned.



Cover with a telescope cap with a hole in centre about one-third of an inch in diameter and the glass is complete. It is very useful, especially to those whose eyesight is failing.



EVENING AT THE HARBOR. By J. C. M. GROVE.



"BRIGHTER THAN MY JEWELS."

By E. DONALD ROBERTS, Jr.

PHOTOCERAMICS.

BY P. C. DUCHOCHOIS.



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PORTRAIT STUDY. By J. SCHLOSS.

CERAMIC–photography is a process that has apparently been neglected by photographers in this country. Probably this is because very little of practical value has been written upon the subject.

Two processes are employed in photo ceramics: *The dusting process* and *the substitution process.* The first gives from the same negative any number of duplicates. The second yields exceedingly beautiful monochromes which may be colored, but for each proof a collodion diapositive must be made. It is therefore only employed for portrait work in photographic establishments.

We will describe both processes. They do not present any serious difficulty, but one should not expect to succeed at the first attempt.

THE POSITIVES.—Whatever be the process employed, the clichés should be diapositives, very soft, transparent, sharp and, of course, free from fog. The intensity is about that of lantern slides, rather less.

The diapositives can be made on Carbutt's photo-mechanical dry plates, developing with ferrous oxalate as recommended by M. Carbutt. However, the best process is incontestably the wet collodion. It is in fact the only one employed by professional photo-ceramists. It would be out of place to describe it in this article, but we cannot refrain from explaining in a few words our manner of working it.

The collodion contains to the ounce 3 grains of sodium iodide, 2 grains of cadmium iodide, 1 grain of zinc bromide and 6 grains of pyroxiline. For sensitizing we use two silver baths, iodized and well sunned, viz: one at 8 per cent. acidified with nitric acid; the other thus compounded: distilled water, 25 ounces; sodium iodide, 3 grains; silver nitrate, 1 ounce; magnesium nitrate, 2 ounces; glacial acetic acid, C. P., 10 minims, dissolved in order.

The collodionized plate is sensitized in the first bath, in the ordinary manner, then washed in the second. The object of the latter operation is to prevent the most annoying and frequent imperfections arising specially in warm weather and by long exposures; we refer to pinholes and to the surface-marking, *i.e.*, superficial local silver reductions.

The developer is the ordinary ferrous sulphate solution acidified by No. 8 acetic acid. The development should be rapid and the image not intensified. Fixing with potassium cyanide.

The Dusting Process.—The reader knows that the dusting process is based on the hygroscopic nature of certain compounds which, acted on by light in presence of a bichromate, lose this property. We give two reliable formulæ:

1. Sugar	40 grains
Gum arabic, best, powdered	20 grains
Honey	5 grains
Ammonium bichromate	10 grains
Water, distilled	1 ounce
2. Glucose liquid	25 grains
Gum arabic, best, powdered	25 grains
Honey	5 grains
Ammonium bichromate	20 grains
Water, distilled	1 ounce

The dose of from 2 to 3 per cent. of ammonium bichromate is normal. With a larger dose the photogene is more sensitive and better adapted to print from intense diapositives. A smaller one tends to yield an image with greater contrasts, and is therefore advisable when the diapositive is very weak. In damp weather the honey is left out, its object being to render the photogene more hygroscopic.

For use the photogene is filtered through absorbent

cotton, the neck of the funnel reaching the bottom of the graduate glass. This is important, to avoid minute air bubbles, sometimes invisible.

The patent plate glass, free from scratches, which serves as a provisional support for the image, is cleaned, *well dusted*, coated, and the excess of photogene being poured in the funnel, the plate is allowed to drain for about a minute on blotting paper, resting on one edge, when it is dried over a spirit lamp, taking care not to overheat it; the temperature should always be endurable to the hand. All these operations should of course be done by an orange or in very diffused daylight.

When dry, *but still warm*, the plate is exposed, under the diapositive, for a period varying from fifteen to twenty-five minutes on a clear day, and from forty-five to sixty minutes, and even more if the sky is cloudy. The exposure is always done in the shade; in the sun, seldom good results are obtained. As seen, the exposure time is long on account of the small dose of bichromate (2 per cent.) the photogene contains. It should be so, for, when developed, the image must be pure, *i.e.*, the high lights very clear, in order not to impair the whiteness of the enamelled or porcelain plate: it is by preparing a photogene of little sensitiveness, and, in consequence, by exposing for a long time, that this result is obtained. If the dose of bichromate is too large for the intensity of the diapositive, the image comes out flat and the very high lights are veiled.

Development.—The vitrifiable colors employed to develop the image must be of an extreme intensity, impalpable. As they come from the dealer, they are seldom fine enough. They should be wetted, then grounded on a glass slab with a glass pestle for a long time and, this done, allowed to dry on the slab, when they should be ground again dry. As to the color, a neutral or a warm gray answers for almost every subject to be colored. Pearl gray is very good for flowers; for portraits, light-brown, red-brown form a good foundation for the shadows. An excellent neutral tint can be made by mixing red, yellow and blue in certain proportions. Remember that the finer the powder,

the more perfect will be the modelling of the picture and the granulation, which in fact should be invisible.

The dusting, or development, as it is termed, is a simple operation: on its removal from the printing frame the image is generally slightly visible; sometimes it is not, however. Whatever it is, the plate is placed on a large white cardboard, or inside the lid of a paper box, where the film is allowed to absorb moisture for, say, two or three minutes. Then by means of a pepper box a certain quantity of the powder, sufficient to well cover the plate, is thrown upon it, and one gently rubs it for a moment with a camel-hair dabber, describing small circles.

On the first application of the powder the deep shadows and the half-shades only appear. This is right. Should the impressed image rapidly take up the powder all over it would indicate *under exposure*, and, as the image would finally be imparted, it is better not to proceed. On the other hand, if the details hang back in the lights specially, and if, after about ten minutes, the development does not progress, the plate having been *over exposed*, no good results can be expected, even by breathing upon it to force the development. Imparting moisture in this manner is not advisable. However, local breathing by means of a quill, *after drying the film*, is sometimes advantageous to bring out the delicate details in the lights without intensifying the shadows.

The development of a rightly exposed image proceeds gradually, according to the more or less hygroscopicity of the parts acted on by light. Hence, those not, or little acted on, absorbing the moisture from the air rapidly, are first developed, while to develop those which have been more strongly acted on, it is necessary to allow them to absorb moisture for a certain period (from three to six minutes) between each dusting-on and after the non-adherent powder has been shaken off. By these successive applications of the powder the image gradually increases in intensity. When, on viewing by transparency on a sheet of white paper all the details are well defined and the whole image a little darker than it should be when burnt in, all the non-adherent powder is dusted off and the picture ready for fixing.



"MOORINGS OFF THE TOWER OF LONDON."

BY E. EVELYN BARRON, M.A.

We recommend to keep the brush quite dry, and to use another one after the first two dustings-on in order to avoid smearing. The powder should also be very dry and kept sheltered from dust, which is the greatest enemy in photo-ceramics, it producing minute white spots on the fixed picture.

Fixing and Transferring.—The picture should be fixed soon after its development, else it would be difficult to detach it from the plate for the transfer. This would also occur if the film were overheated when drying it.

To fix it, the picture is first coated with a plain collodion at 1 per cent., and as soon as the film has set one cuts the edges with the finger nails around the plate, which is then immersed for about three minutes in water acidified with 3 parts of sulphuric acid per 100, in order to destroy the adherence of the film to the plate and to eliminate the chromium salts. This done, the plate is carefully removed from the acid bath with the picture still adhering to it, well rinsed under a gentle jet of water, and, one having ascertained that the collodion film does not adhere by the edges, the plate, *collodion side downwards*, is lowered in an inclined position into a large basin filled with a solution of dextrine, fifteen grains to the ounce of water. In this solution the film detaches itself, or it may be easily detached, and floats *picture side upwards*. It now remains to transfer it on the enamel plate or porcelain. For that purpose the material, cleaned with rouge and alcohol, then dusted, is placed on a copper spatula, bent at right angles at one end, and introduced under the pellicle, when the latter is carefully brought upon it by means of a brush. This done, the material, with the image held upon it, is slowly lifted out from the water, and one having placed the picture in position and cut the edges of the collodion film hanging over, a sheet of tissue paper is laid on the whole, whereby, by lightly dabbing with a bung of cotton, the picture is sponged and adherence secured everywhere. When dry the picture is ready for the fire.

By transferring, as said above, the image is in the same position as on the diapositive, and the collodion film being in direct contact with the enamel plate, or the porcelain, and

brided by the powder, burns without injuring the picture. This manner of operating, although rational, is not, however, that employed by every photoceramist; some of them prefer to transfer the image downwards, that is, in contact with the object, as there is less danger of spoiling the picture, which in this case should be impressed from a reversed diapositive to have it in the right way. The series of operations does not differ from that before described, except that the collodion should be destroyed, else the picture would split or scale when the collodion is inflamed.

To destroy the collodion it suffices to flow the film over with sulphuric acid; in two minutes the collodion is disorganized. The plate should then be washed under the tap, then with diluted ammonia, when it is flowed with a saturated solution of fused borax and allowed to dry spontaneously.

The destruction of the collodion film by sulphuric acid is not without danger, and this acid cannot be employed when the picture is developed with certain vitrifiable colors. Another process is then employed; it consists in immersing the plate in a bath compounded with wood alcohol and 10 per 100 of ether. When the collodion is dissolved the plate is washed with the same solution and allowed to dry. This process is safe and the image remains quite adherent to the object.

Before firing it is advisable to bind the color to the material upon which it is transferred. This is done by flowing it, as said above, with a solution of fused borax or a mixture of two or three parts of fat oil of turpentine and 100 parts of ordinary turpentine.

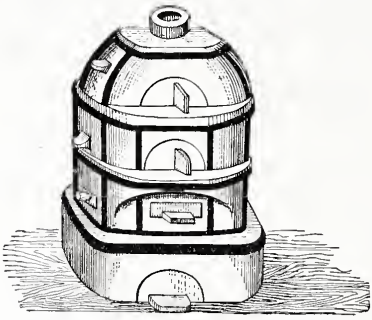
Firing.—The firing is not a difficult operation. However, we advise one to see it done by a professional enameler if possible.

Several kilns can be recommended.

Kilns heated by gas present many advantages—cleanliness, absence of smoke and, which is quite important, the temperature can be regulated to the red-cherry heat, which is the melting point of the vitrifiable colors.

The Clay Furnace is still much employed. It is made

for muffles of different sizes, viz., from 7 x 4¾ x 3 inches to 14 x 8 x 5 inches. It consists of three pieces, the furnace, the muffle and the cover. To build the fire the cover is removed, then one disposes a layer of shavings and over this charcoal and coke on the grate, and, after setting fire, the cover is replaced with the chimney—a stove pipe about one foot long. When the fuel is lighted, the muffle is inserted, and over it one packs coke and charcoal in a more compact and greater quantity than under the muffle, for it is this fire which produces the glazing. If the fire was built otherwise the picture would never glaze. Now, all the overtures should be closed, and when the muffle has reached the red-cherry temperature the enamel can be fired.



FURNACE FOR FIRING.

It is important, in order to judge the right color of the muffle, to operate by a very diffused light. In a well-lighted room a bright red seems dull, while in the dark, red heat looks more intense than it is in reality. As said above the cherry red is the temperature at which the vitrifiable colors should be burnt-in, and the heat must not rise much above it.

This manner of firing is as follows: A disc of fire-clay is placed in the muffle, and when it is heated to the cherry heat another one is placed upon it, with the enameler's tongs, until warm, when it is removed on the appendix in front of the door of the furnace and the enamel plate placed upon it. There the plate is gradually heated, one meanwhile revolving the disc from time to time to equalize the heat, and when it is hot one removes near it the cherry-red hot disc from the muffle, and upon it pushes the enamel plate. The whole is then placed in the muffle. From this moment the operator should attentively follow the phases of the vitrification, for a few minutes suffice to melt the color, and if it were overheated the picture would lose much of its

vigor from the volatilization of the colors, which, as the reader knows, are metallic oxides.

When the enamel is introduced into the muffle, the image, which is matt, seems to vanish, and the surface of the plate take a brilliant, water-like appearance, which indicates that the vitrification is effected. If this appearance extends to the whole image, the enamel must be removed from the muffle, but it sometimes occurs in places, especially if the enamel is large, for the heat is ordinarily less intense near the mouth of the muffle than in its interior. Hence, during the operation the disc should be turned round once or twice to equalize the heat all over the enamel.

It is advisable during the operation to remove the disc for an instant on the appendix to ascertain how the vitrification proceeds. So long as the deep shadows of the image remain matt, it is not complete, and the enamel should be replaced in the muffle.

On its removal from the muffle the enamel must be allowed to cool very gradually, otherwise it may crack or the picture scale. For this purpose it is placed on the appendix, near the mouth of the muffle, turning it round now and then until partly cooled, when it may be placed on a hot clay plate to cool entirely.

Porcelain and tiles are fixed in the same manner.

The Substitution Process.—This process consists in the substitution of gold, platinum, etc., for the silver constituting the image of a diapositive obtained by the wet collodion process. This diapositive developed, without intensifying, is immersed, after fixing and washing, in a diluted solution of sulphuric acid, 2:100, for a few minutes, to destroy the adherence of the film to the plate glass, then washed and afterwards flowed with a solution of bichloride of mercury, 5:100, until the image is uniformly blackened and has a tendency to bleach, when, after rinsing, the picture is detached from the plate under water, then transferred in a bath of substitution by means of a shellacked cardboard.

In the bath of substitution the image must be toned through in order to obtain the same coloration in every part, the substitution being more rapid in the half-tones than in

the deep shadows. The toning cannot be overdone, for when the metallic silver, which forms the image, is converted into chloride the chemical action is at an end. Hence, the perfection of the burnt-in image entirely depends upon that of the diapositive. After washing the image is transferred on the enamel, or porcelain, as it has been explained. Here are three formulas for the bath of substitution:

1. Chroplatinite of potassium..... 2 grains
Chloride of gold solution..... 1 drachm
Distilled water..... 1 ounce
Lactic acid..... a few drops
The tone is a purple brown.

2. Chloroplatinite of potassium..... 5 grains
Palladious chloride..... 1 grain
Chloride of gold solution. 1 drachm
Distilled water 5 ounces
Lactic acid..... a few drops
The tone is sepia.

3. Chloride of iridium..... 2 grains
Chloride of gold solution..... 1 drachm
Distilled water..... 1 ounce
Lactic acid..... a few drops
The tone is warm black.

GOLD SOLUTION.

Gold terchloride.....15 grains
Chalk.....20 grains
Distilled water..... 2 ounces
Shake well and filter.

We append the process of M. Henderson:

Chloride of platinum..... 5 grains
Chloride of tin.....30 grains
Iodine..... to saturation
Hydrochloric acid..... 1½ ounce
Silicate of potash, commercial.....20 grains
Acetate of lead.....40 grains
Distilled water.....16 ounces

The *collodion* diapositive—not intensified after the development—is first loosened from the plate by diluted sulphuric



"GRETCHEN."

BY J. W. DUNN.

acid to facilitate its ulterior separation, and the plate, well washed, is afterwards immersed in a solution of potassium iodide, 4:100, saturated with iodine; in a few minutes the image is converted into silver iodide and takes a yellowish coloration. The film is now generally quite loose, but should be held on the plate to transfer it to the above bath of substitution, which during the chemical change must be kept gently moving. In the bath the image is transformed; it becomes black and is covered with soot. This transformation is sometimes very long, but it can be accelerated by moderately heating the bath. Presently, the image appears a good deal darker than it should be and of a dusty opaque black when transferred to the enamel. After transferring, the enamel is drained, then dried and gradually heated on the appendix of the furnace. In a short time the image turns entirely brown, and may be introduced in the muffle, where it commences to take a varnished appearance on the edges, then the high lights become brilliant. If the enamel is at this moment removed on the appendix, it is of a fine primrose color, but the shades and the black parts of the image are still heavy. If fixed a few moments longer, this color still persists, but, then, the whole surface has become brilliant, which indicates that the firing is perfect. The enamel is now allowed to cool gradually, when it loses its yellow color and becomes perfectly white in the high-lights.

Many persons think that the success in firing depends upon the period the enamel should remain in the furnace. Such is not the case; it may remain for a few minutes after the vitrification is effected without it being injured, provided the temperature is not pushed much beyond the melting point.

If during the firing the image appears too dark, impasted, the enamel must be removed from the muffle when the details are glazed, but not the dark shadows. Then the latter are carefully rubbed with emery to lighten them, and, this done, the enamel is replaced in the muffle.

Glazing.—To impart brilliancy to a monochrome, and this is generally necessary when it is made on porcelain, a glaze

is applied in the following manner: Brush over the picture a thin and even coating of a mixture of 2 parts of fat oil of turpentine and 3 of the ordinary oil, and dust over a very fusible flux when the coating has become sticky by evaporation in the air. This done brush off the powder in excess and fire.



"AT THE CITY OF LONDON'S PORTAL."

BY E. EVELYN BARRON, M.A.

FORMALINE AIDS.

BY WM. BELL.



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ANNA ROBINSON. By J. SCHLOSS.

THERE are no doubt many who have experienced difficulty in strengthening and reducing negatives after fixing in hypo that contained chrome alum. Would advise to harden negative after fixing, washing, strengthening or reducing (if necessary) in a solution of formaline, two (2) ounces; water, thirty-two (32) ounces. Let negative remain in this for two minutes, and without any further washing dry in the sun or over-head.

The same proportions will be found very useful in hardening the soft gelatine printing papers, removing all stickyness and facilitating mounting. They should be put in above solution after toning, fixing, washing, for five minutes, and from the formaline solution hung up to dry. Two ounces of formaline to 32 ounces flour paste makes a paste that keeps indefinitely.



PUEBLO INDIAN VILLAGE, NEW MEXICO. By C. B. WAITE.

WANTED, A PAPER.

BY VAL. STARNES.



"A BARNYARD PET." By J. W. DUNN.

THERE is a crying demand for an absolutely permanent printing out paper that will give pleasing and artistic results, and yet withal can be purchased for a moderate sum. If one of our scientific investigators and experimenters would drop the X-rays and color printing and turn his attention to producing such a paper, he would, in the event of success, earn the gratitude of the large army of amateurs, for certainly nothing now in the market can be said to fill the bill in every particular.

Few of us can afford platinum, carbon or bromide, to say nothing of the last two being troublesome and "messy"; albumen is vile, and neither it nor ferro-prussiate is at all artistic; gelatine is easily worked and its effects are pleasing to most people, but, together with collodion, is utterly lacking in permanency—in my hands, at least.

Perhaps the last five words are the real key to the situation, after all. If such is the case, I will enlarge upon my original intention of briefly voicing a universal want, and beg some one to help me in discovering where my trouble lies.

I have tested most of the gelatine, and many of the collodion brands of paper; I have carefully followed the various accompanying formulæ, and whatever others I could find, both for combined and separate baths. I have made prints here at an elevation of four hundred feet in lat. 33. a thousand feet higher and one degree farther north, and at the base of the Rocky Mountains, five thousand feet above

the level of the sea in lat. 45; I have used ordinary well water, cistern water, and water from the alkali streams and pure mountain torrents of Wyoming; but as a whole I have but one result to record—failure from fading and discoloration.

I have some few prints that are in perfect condition, of course, but I can assign no reason for their permanency, for others made within a few minutes of them in the same bath and on the same paper are as yellow as saffron. If it were possible for me to come to any conclusion, I might say that I have more perfect specimens toned in a commercial combined bath than any others, some of these being five years old, but there are not enough of them to give me the least encouragement. None of my negatives show the slightest sign of hypo, so I can lay no blame at their door. Nor can I accuse the mountant, for I have tried all of the prominent pastes, and my collection of spoiled prints is so catholic that it includes them all. No, the paper alone, I think, is responsible.

What is the matter? Won't somebody tell me? If not, won't somebody please produce as soon as possible a paper of the kind mentioned above and place it on the market for the benefit of those—if any there be—who are as invariably unfortunate as Val Starnes.



"GATHERING GRAIN." By LAWRENCE J. BRENGLE.



Copyrighted 1895, by E. Donald Roberts, Jr., Detroit, Mich.

A FLOWER OF THE EAST.

By E. DONALD ROBERTS, Jr.

NOTES ON X-RAY PHOTOGRAPHY.

BY JAMES H. STEBBINS, JR., PH. D.



"HOMEWARD." By G. L. WILMS.

HAVING been greatly interested on the subject of radiography since the announcement of Professor Roentgen's wonderful discovery, it occurred to me that a description of some of the data necessary for the successful working of the process, which have come under my observation, might not be out of place.

Plates.—In my first experiments, I used the fastest plates which could be bought in open market, but without obtaining very satisfactory results. I then tried very slow ones, which, though an improvement over the fast ones, were not entirely successful. After trying a number of other plates of varying speeds, I have finally settled upon a medium fast plate, viz.: the Cramer Banner, which in my hands, gives most excellent results. The negatives obtained with these are clear, with plenty of density where it is most required, and as far as the speed of exposure is concerned, they compare very favorably with any which I have tried. In developing, I invariably use Hoover's pyro developer.

Crookes Tubes.—There are many makes of Crookes tubes upon the market, and I have tried quite a few of them, but the only tubes that have given me full satisfaction, are

those manufactured by the successors to Geissler & Co., Bonn, Germany.

These tubes are manufactured in various shapes and sizes, but the large pear-shaped tubes have given better results in my hands than any of the others. They are thoroughly seasoned before leaving the manufacturer's shop, and consequently will be found to work well from the very start.

In photographing it must be remembered that the farther away the tube is from the object, the greater will be its covering power. Therefore if it is desired to evenly cover an 8 x 10, or 10 x 12 plate, the tube should be elevated at 15–18 inches above the object to be photographed. Of course the farther away the tube, the slower will be the exposure; but, with a 4 to 6 inch spark coil, good pictures of hands, arms, etc., can be taken with exposures of 30 to 15 minutes, even with this distance between the object and tube.

Fluorescent Screens.—It has been attempted to shorten the exposures by interposing a fluorescent screen of tungstate of calcium, or other substance, between the plate and the object to be photographed. This is best accomplished by placing such a screen directly over, though not actually in contact with the plate. There is no doubt but that this device shortens the exposure by more than one-half, but, it has two drawbacks, namely, the backgrounds of the negatives when developed will have a very coarse and grainy appearance, owing to the grainy substance on the screen, and the radiographs themselves seem to lose considerably in sharpness thereby. I have tried to overcome the grainy appearance of the negatives by using a screen covered with a very finely pulverized and sifted tungstate of calcium, but with no appreciably better result. Therefore, although the exposures are greatly shortened by this means, I still prefer to take my pictures without the use of a screen, as I thereby feel certain of obtaining sharp and well-defined negatives, entirely free from the objections above enumerated.

Diaphragms.—It will sometimes happen that when photographing certain parts of the body, as for example, the feet, that the toes will receive proper exposure long before the thickest portion of the foot has been penetrated by the

rays. If such a plate is developed it will be found that the toes have been so greatly over-exposed that it will be difficult to distinguish the bones from the surrounding flesh. To overcome this difficulty I have constructed a diaphragm out of a piece of tin plate of the same size, or a trifle larger than the sensitive plate, and move it around over such portions of the object that need the greatest amount of exposure in exactly the same manner as is customary in ordinary photography. In this way it is possible to obtain the radiograph of a foot, with all parts properly exposed. The X-rays are by this means held back by the metallic diaphragm in the same manner as white light is held back by an ordinary card-board diaphragm, or vignette.

I do not know whether the above will offer any great novelty to such readers of The Photographic Times Annual who have already been at work upon radiography, but I offer these remarks for what they are worth to such of your readers who are just beginning, or who contemplate taking up this interesting study, with the hope that to these my remarks may be of some slight assistance.



"5 O'CLOCK TEA." By G. E. VALLEAU.

LIGHTING IN PORTRAITURE.

BY J. WELLS CHAMPNEY.



STUDY. By J. WELLS CHAMPNEY.
(From reflection in a mirror.)

IF AN importunate editor flatters one by a constantly renewed demand for an article, it is extremely difficult to refuse, especially if he knows all about what you have to say.

Whether or no the reader will find matter of interest in this article can only be decided by its preparation and publication. Without further preface I offer these suggestions which have been the result of not very careful experiments for a year past.

My studio light is a good one, and photographs can readily be made there under ordinary conditions, but it occurred to me that new and pretty arrangements of light would vary the common side light effect, and so with curtains and screens, and mirrors as well, I have tried a variety of effects.

The most useful, I should think to the amateur, frequently cramped for space and limited in light, is the first I shall describe.

My window consists of a large plate of glass fully eight feet wide by ten feet high. There is no top light, and I frequently desired to produce this effect. I have brought it about by hanging a white curtain, wider than the window, from the ceiling, placing it a couple of feet back from the window. This curtain is pulled *down*. At the lower edge of the window is what is called an opaque curtain which can

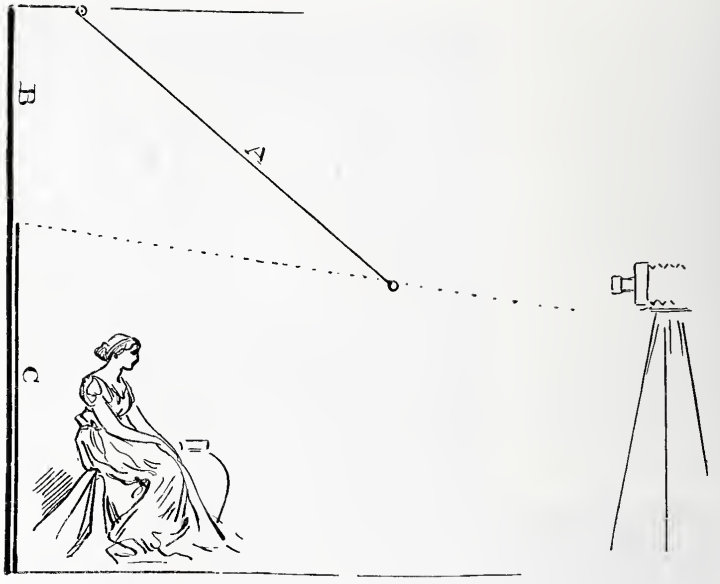
be pulled *up*. The dark curtain I raise so that it is above the head of my sitter, where it forms an excellent background. My sitter, we will say, faces into the room and is consequently entirely in shadow except for such light as





falls upon the top of the head, shoulders, etc. This is so bright and the shadow so dark that no satisfactory photograph could be made until the large, white curtain is pulled *down* and drawn somewhat into the room. When the curtain is thus lowered so

PORTRAIT STUDIES. By J. WELLS CHAMPNEY.



GROUND PLAN.

WINDOW.

Dark curtain to be raised

● Sitter with back to window.

White curtain fastened to ceiling to be pulled down at an angle so as to reflect light.

Camera.

Facing window

far enough away to shut out sky-light.



PORTRAIT STUDIES.



BY

J. WELLS CHAMPNEY.



as to be below the upper line of the dark curtain against the window there is produced the soft effect of a top lighting in all the parts that were before very dark.

The camera is set in the room facing the window, but far enough back from the window so that the white curtain hides from the lens the direct rays of sky light.

Under these conditions such pictures can be obtained as are shown in the illustrations to this article.

It not infrequently happens that the sharp brilliant light falling on the model is not agreeable. By the use of thin draperies suspended by strings, that light can be tempered or entirely removed, and the pretty diffused top light be produced.

I am of the opinion that very satisfactory results could be reached under what would ordinarily seem impossible conditions, and I suggest that some one make the experiment in a small room—a hall bedroom—pinning a blanket across the lower portion of a window, and suspending a white sheet from the ceiling. There would then be a severe test made of my scheme, and the editor of *The Photographic Times* will be pleased to make a cut of the most successful picture produced under these conditions.

To further vary my lighting, I have hung a fine plate-glass mirror against my dark window curtain, then placing my sitter in the light, this time facing the window, photographed from the reflection in the mirror. The glass must be a perfect one or there will be distortions.



"TWILIGHT," MID-OCEAN. By T. FRANK ATKINSON.



Copyright, 1894, By B. J. FALK.

PORTRAIT.

BY FALK.

CARBON PRINTS.

BY CHAPMAN JONES, F.I.C., F.C.S., ETC.



By P. BERGON.

CARBON PRINTS are becoming more popular. It is a good sign, because, if properly selected pigments are used in preparing the tissue, we may be confident that our work is not wasted in the production of a changeable picture. But carbon printing to many means either a single transfer print which is laterally inverted and therefore always annoying, or the extra trouble of a double transfer, or else the adoption of a non-transfer process. These non-transfer processes, whether the Artigue or the gum process, are somewhat troublesome and uncertain, and have not yet been shown to give a truthful gradation, so that however apparently fine the results produced by their means, one does not feel justified yet in giving them an unqualified recommendation.

There is, however, one method of producing carbon prints that is certain and simple, and gives non-reversed results. It is indeed, I think, the very easiest possible. It is not new, but it does not appear to have been often used, though it gives bright results without hardness. It is simply the production of a thin carbon transparency, and backing it when dry with whatever material may be preferred. The print is on the glass, so that a tinted or white, rough or smooth-surfaced paper may be put behind it in turn to see which is the most suitable for the final mounting. I think that it is more easy to develop a print on glass than on paper, and neither the glass nor the tissue needs any preparation other than seeing that they are commonly clean.

This method has one other advantage that may be worth

considering, namely, if the print should be over-exposed the transparency will in most cases be suitable for copying purposes; probably it will be as good a transparency as can be made for the purpose. If not immediately required the transparency will probably be useful eventually if the negative is valuable, for from it other negatives can be made of any size.

The simple transparency on the unprepared glass consists, as is well known, of a layer of gelatine that is thicker as the tone of the print is darker. If, therefore, the gelatine is uniformly colored by any means the picture is reinforced. If the tissue used contains a rather small quantity of pigment, or if the pigment is light in color, like the so-called "red chalk" tissue, this method of modifying the tint or producing new colors, allows of a very great variety of treatment. But whatever dyeing material is employed, the greatest of care should be taken to see that it is not changeable by exposure to light, for carbon prints are permanent only when the pigments used in them are permanent.



INTIMATE FRIENDS. By MABEL OSGOOD WRIGHT.

PHOTOGRAPHY IN MEDICINE AND SURGERY.

BY ELLERSLIE WALLACE, M.D.



Copyright, 1894, By J. Schloss, N. Y. By J. SCHLOSS.

ANY mention of the use of photography in medicine and surgery will naturally call to mind the great discovery of Roentgen. But it is not of this that I wish to speak here, except to say that it is probable that the true usefulness of this discovery will ultimately consist in direct examinations by the eye. The unfortunate fact that the new agency cannot be refracted nor treated in any other manner like light for the purposes of picture-making will set a limit to the usefulness of the camera, and rather urge on all methods tending to simple ocular inspection.

But, in spite of all this, there is an immense and new field open for photography in connection with the X-Rays, and I cannot here attempt any remarks upon a subject to which the daily press is constantly referring. I desire, rather, to briefly refer to some of the older uses of the art which may prove useful to teachers and students of the healing sciences.

Much can be done in the way of demonstration to classes by well prepared enlarged prints. Some years ago I was commissioned to make a lot of negatives of bones for solar enlargement. The work was done on plates about 5 x 4 inches, and the negatives enlarged to considerably more than life size in the ordinary solar camera on plain silvered paper. The prints came out very clear, for I had taken eare to pose the bones on black velveteen, and to develop the

negatives just to the point when the details of both lights and shadows would make clear impressions on the enlarged print. I found that the quality of negative most successful here was one so delicate, or weak, I had rather say, that no good contact print could have been struck from it. The extreme high lights were transparent enough to read print through, and the gradations of detail were carefully preserved into the deepest shadows. The prints could have been mounted and exhibited at once, but it was preferred to cut out the entire outline of the bone and gum the skeleton print thus obtained on white cardboard, sometimes reinforcing important lines with a narrow band or border of water-color carefully laid on with a fine camel's-hair pencil. Candor compels me to add that the bones in this case were simple in outline; such a proceeding would have been an arduous one with the sphenoid, for example.

At the farthest corners of the large lecture-room in which they were used before classes of six hundred students the effect was excellent and all the details clearly visible. I thus made a complete set of the female pelvis, showing the planes and straits involved in labor, besides some of the foetal head in different positions, particularly those where the "fontanelles" were distinctly seen.

This is, of course, only one of many uses to which ordinary photography can be put for class demonstrations. I may say, however, that simple as the work is to those of us who have had experience with the camera, a beginner disregarding such matters as the proper lighting of the bone and the nice balance between the exact timing and development of the plate would make discouraging failures. And another thing that most beginners would do in such work as this is to use their wide-angle lenses and bring the camera so close to the bone that the perspective is destroyed and the picture made a mere caricature. Now, for anatomical purposes, exactitude is the *sine qua non*, and distortions, such as I speak of, would utterly condemn work which might be perfect in other respects. My own work was done with a Dalmeyer Rapid Rectilinear of eleven inches focus, and the size of the foetal head on the negative was perhaps half life-size.

Those of the pelvis were still smaller; the entire bone with this long focus and small plate (5 x 4) being about the size of a silver dollar. A rather small stop was used to secure perfect sharpness all over, so that nothing might come out fuzzy or blurred in the solar enlargement.

I can imagine that good pictures of the growing trees, shrubs, plants, etc., from which the various vegetable articles of the Materia Medica are collected, especially the large and showy ones of tropical regions, would prove a fine embellishment to a course of lectures on this department of medical study. And yet I can truly say that I have yet to see a fine large (22 x 18) photograph of a poppy, cinchona tree, stramonium, or almost any other plant from which an officinal article is prepared. Let me throw out this to those who reside in regions that furnish medicinal plants, particularly the less-known tropical ones. Just let such persons make good negatives of the shrub or tree at any odd time. Enlargements are easily and effectively made, and such prints would surely find ready sale.

Photography can be even more usefully resorted to for purposes of private study, where the picture can be held in the hand and examined at leisure. The soft tissues of the human body are none too grateful subjects for the camera, but stereoscopic pictures of wounds, injuries, etc., are very valuable, yet seldom seen. The same might be said of skin diseases carefully taken upon orthochromatic plates so as to give more exact color value. Instantaneous pictures of abnormal movement—chorea, locomotor ataxia, convulsions, that terrible condition known as opisthotonos, and much more of the kind—where are they? Conspicuous by absence, I think.



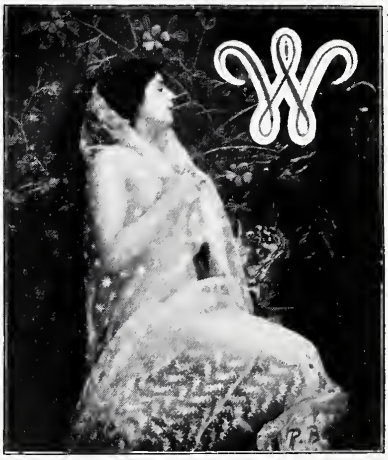
AT KUSSNACH. Lake Lucerne. By ERNST LAMBERT.



"CLEARING." BY L. C. BENNETT.

A FEW NOTES.

BY DAVID GRAY ARCHIBALD.



By P. BERGON.

WE often hear an amateur photographer say, after witnessing good work done by others, that he would like to do the same, but—where is he to find "the subject?" Who wants you to find that subject, Mr. Amateur? It is already found. What use is there in doing what has already been done and well done? Why not go into the field and get something new, something original?

There is only one way of obtaining fine negatives and that is by using many plates. The more you use, considering your judgment to be good, the better the results; the larger the number of moderately poor ones you are able to throw away, the larger the percentage of successes you will have. It always leads to greater satisfaction. The last view may be the one you wanted. How often, when you have exhausted your plates—and patience, the model has fallen into an attitude both natural and pleasing, better than any of your making.

So, take many plates of the same subject and—do not *talk* so much about your work. Let the results speak for you. There is entirely too much talk in the amateur ranks. What we want is results, and they are obtained only by working. We want less of criticism or what passes for such—as fault-finding, picking to pieces the work of others, making *jokes* about anything and everything. We want broad views of the art, not narrow ones. To do is harder than to preach.

There is not the least bit of doubt that there are many valuable things and thoughts lost to the world because some smart person has ridiculed that of whose outcome he has not mental capacity to deduct the possibilities.



PHOTO COLORTYPE CO.
Chicago & New York.

TABLE FRUITS.

DIRECT REPRODUCTION
FROM NATURE

The world is full of people who discourage all attempts at originality in action or thought. They are constantly saying, "don't do that," "do this, or that in this way," etc., etc. I say, do it in your own way, making that way the best you know, and I'll warrant you will be surprised ere long with satisfactory and novel results.

In the matter of slide making, don't spare the plates, make many of them from the same negative. Do this at the one time, for when you are at work you will find many things to remedy which might escape your memory should the work be left for another time.

Do fewer subjects, but seek better quality. One slide that is beautiful, effective, or unique, will be remembered as yours, while a thousand that are indifferently good may simply bury the artist by their tedium. There is much that the finishing admits of in the way of improvement.

Think once in a while. Don't take pictures blindly, which means, in too many cases, that you allow them to make themselves.

You can never rival the painter, so don't try to; but do try to produce as good work as you and your camera are capable of. If you cannot improve the art, don't degrade it.

The more one hears this everlasting cry of "easy to do," "does itself," etc., etc., and many similar beautiful but misleading headlines which are sprung to catch the money of the don't-want-to-take-the-trouble crowd, the more he will be afflicted with work which would disgrace a school boy, and the more he will be compelled to praise worthless (?) subjects. Make up your mind that a thing which can be done easily, be it photographic or otherwise, is not worth the doing in a majority of cases. Do not think you are exhibiting good taste by not doing anything—that may mean want of taste.

There never was a rational desire in the mind of anyone to accomplish a thing but that had its realization, and the world was the better for it. There is not always the desire when we think there is, or, rather, it does not always spring from sincerity. It may be mere vanity. We mistake the shadow for reality.

"SUBJECTS FOR EXPOSURE."

BY WALTER SPRANGE.



Off the Battery.

THE rapidity of the growth of the more important centres of this country has resulted in an almost simultaneous erection of immense blocks of buildings, massive and imposing; but, as a rule, destitute of the picturesque and devoid of any distinctive local character. The Bank, Insurance, Post-office and other business buildings have during the past decade been almost invariably built on similar outward lines, the interiors only being especially designed for the purposes for which they are required. Whole streets of them fail to impress one with the beauty of their architecture, because no attempt is made towards either unique or picturesque outward presentment, and being usually of uniform height, the general impression they give is that of a monotony of lofty buildings, without either individual or local distinctive features.



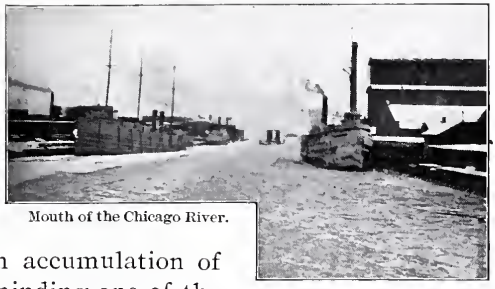
Brooklyn Bridge.

So that the camerist on a tour through the country is at a loss to discover characteristic views of the centres visited, and is fairly puzzled to know what to select for objects for the exposures of plates. No doubt the residents of any of the places visited may



The Hudson River.

be familiar with many picturesque spots in them, but they are largely limited to the public parks and open spaces, which, after a few exposures, only afford an accumulation of similar subjects, reminding one of the invariable invitation extended to visitors in the smaller towns to "Come and see our cemetery, it is such a lovely spot."



Mouth of the Chicago River.



Vista by the Hudson.

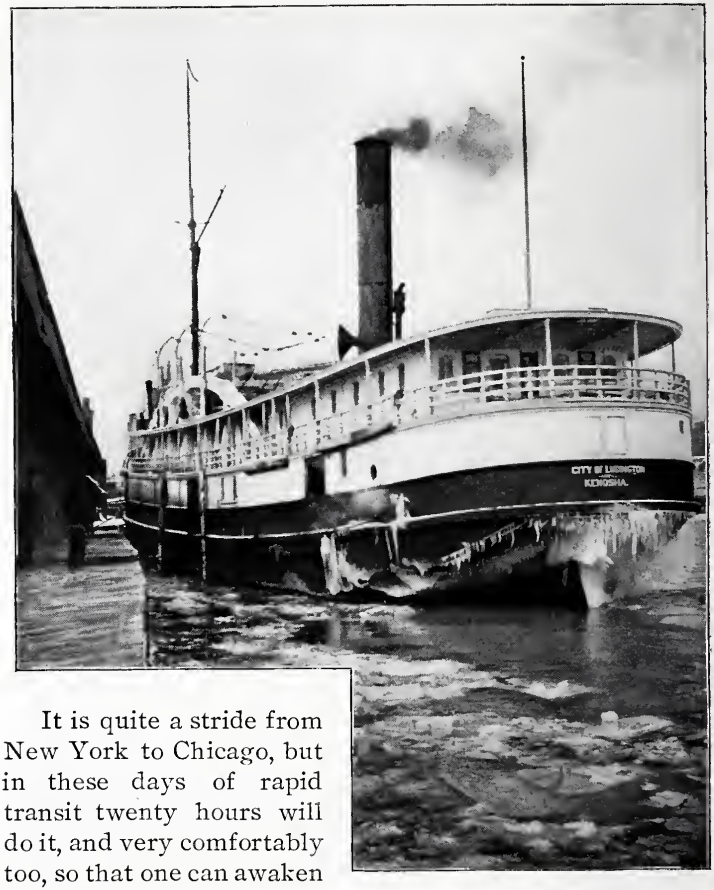
The rivers and water-fronts of the larger centres afford an abundance of material for future development, and thoroughly characteristic material too. Can any one mistake the small view here given of New York from off the Battery? There is only one Castle Garden, and it is doubtful if any other city can claim a *Castle* which has received more visitors within its confines during the same length of period (35 years), in which it was used for an immigration depot. The two rivers which meet off the Battery afford a variety of characteristic scenes, of which the above are perhaps the most familiar, Brooklyn Bridge, across the East River, and the Hudson from Riverside Park.



Suspension Bridge, Cincinnati.

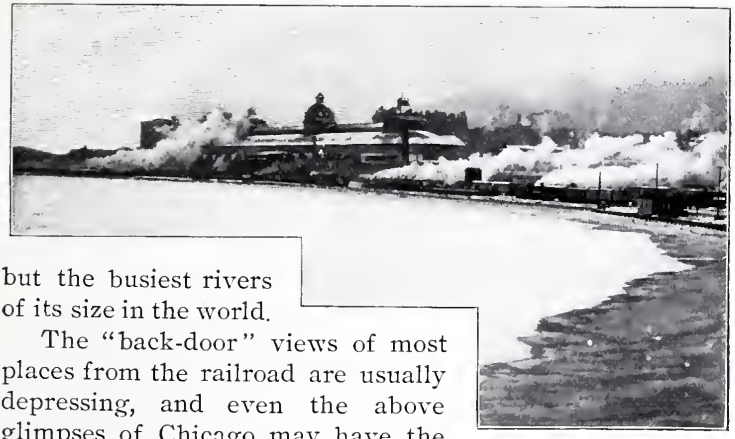


A Boat-Landing, Cincinnati.



A Lake Propeller.

It is quite a stride from New York to Chicago, but in these days of rapid transit twenty hours will do it, and very comfortably too, so that one can awaken the morning after leaving New York with the unpicturesque but characteristic view of the basis of Chicago's wealth and commerce conveniently presented at the window of the sleeping car, and a few steps up the long bridge, which crosses the railroad tracks, will afford an unobstructed view of the once beautiful lake front, now monopolized by the unsightly railroad, with its unavoidable noise and smoke. While a short walk in the opposite direction to Rush Street Bridge will bring to view the mouth of the Chicago River, one of the smallest



Lake Front, Chicago.

but the busiest rivers of its size in the world.

The "back-door" views of most places from the railroad are usually depressing, and even the above glimpses of Chicago may have the effect of causing the instant purchase of a ticket to Cincinnati, where the Ohio River and the atmosphere present their appearance. The primitive character of the boat landings, necessitated by the rapid and pronounced rise and fall of the water at the changing of the seasons, is thoroughly a part of this important center. Cattle and other food products, from the farms above and below



Louisville & Jeffersonville Ferry.



A Boat-Landing at Louisville.

on this stream, are hurriedly shipped on board from the banks of the river by the deck-hands of the passing boats, and are as unceremoniously landed on the banks of the river at Cincinnati to await the pleasure of the consignees.

The city of Louisville, a few hours' journey from Cincinnati down the Ohio River, affords an abundance of good material for the camerist. The air is usually clear and the river very broad, on the banks of which a constantly busy throng of "darkies" and their natural companions—the ever patient mules—furnish a fresh variety of studies, many of which have the characteristic traits of the "Sunny South," and, after all, it is the Southern States which contain a never-failing source of interesting studies for the camera.



Western River Boats.



At St. Louis.

In St. Louis the camerist is again afforded an excellent opportunity to master the perplexities of atmospheric effects, the density and composition of which varies very materially, and sometimes vies very successfully with that of Cincinnati. The Mississippi furnishes many very fine studies, and the view given of the river and bridge could hardly be mistaken for that of any other city, and seems to be characteristic of the place.

If the camerist will give the rivers and water fronts of various places they visit a few hours' study, the results will be more than satisfactory, and will readily afford views more artistically rendered than those here presented, which were taken haphazard some time ago, with no thought of reproduction, and are simply introduced to better convey the idea suggested by this article.

SNAP-SHOOTING AT A SOIREE.

BY HECTOR MACLEAN, F.R.P.S., F G.S., ETC.
(Author of *Photography for Artists.*)



"ENJOYING THE PICTURE." By HECTOR MACLEAN.

IT is strange how few people use the hand-camera in the home for group-taking; this, in spite of the fact—and fact it is—that in many respects a snap-shot taken in one's room usually results in far more pleasing group pictures than are those obtained in the open air. The reasons why this is so are too many to be here elaborated; a very sufficient one, however, is that sitters are usually more becomingly attired, especially those of the fair sex, when at home, than when in outdoor costume. Be that as it may, no doubt most of my readers would often be glad

to secure pictorial mementos of the many charming crowds of gaily-dressed friends who, all through the winter, foregather to do honor to Terpsichore or to St. Cecilia.

This being so, I append a few lines explanatory of a method I pursued which yielded a series of groups that gave my guests very considerable satisfaction.

I seized upon that moment when there was an exodus from the dancing-room, and a tremendous squash in the supper rooms, where young England was busy in the enjoyment of what *Punch* calls "a regular stodge."

The figures available were quickly arranged in the now deserted salon upon a rout seat, the camera being ready filled, focused, and in position.

Perfection in portraiture was, of course, not looked for, the main objects in view being to get rid of the usual pose which disfigures most groups, and secondly for the children to be so arranged that the eyes either did not show, or so little of them was visible that the way they were rendered was a matter of no importance. This, in view of the well-known fact that flash-light figure studies are in most cases entirely spoilt by the reflection of the flash in the eye producing an unnatural and objeetionable appearance of stare; at other times the eye blinks, with the result that the sitter appears as if sound asleep. An examination of the print of one of the groups will show how far I have been successful in avoiding those pitfalls which I had foreseen.

The method followed in arranging the groups was as follows: Having selected half-a-dozen girls, I shortly, but as clearly as possible, explained to them *exactly what I wanted to do*, and how I proposed to do it, particularly telling them why their eyes should not show. Giving one of them a colored print, "Suppose yourselves all eagerly 'Enjoying the Picture'," said I. The hand-camera, which focused to scale, was placed upon a milking stool some 18 inches high, and distant about 20 feet from the group; a preliminary flash was let off to accustom the children to the sudden brightness.

Then, the ordinary gas being left brightly on, the lens was uncovered, and, at the word of command, "One, two, three—*now!*" two flashes, from two ordinary blow-through



PORTRAIT.

BY MORRISON

The Blanchard and Watts Engraving Co.

methylated spirit hand lamps, were simultaneously given, about 5 grains magnesium powder being burned in each lamp. A medium isochromatic plate was used, with the lens stopped down to *f*/11.

I should say that I, in most cases, found the children quickly appreciated what were the essential points needful for them to bear in mind and act up to. My experience points to the fact that well-educated young people are far more amenable—I will not say intelligent—than are older folk when one is seeking to group them as above. Independent of the fact that "grown-ups" are oft-times slower to conceive what is wanted of them, and are more awkward in adapting their attitudes and positions to what is desired, they seem to possess so good a share of vanity as to be quite incapable of lending themselves to the illustration of what the photographer may consider a happy, or harmonious, or telling disposition.

Thus, in the group printed herewith, had the figures been of ages varying from 20 to 50 years, strongly artificial and constrained attitudes would have been assumed, probably by every sitter, in order either to hide some more or less imaginary defect, or to emphasize some not less imaginary beauty. Observe, for instance, the hands; note their individuality of disposition—their absolute naturalism; had the sitters been older, the hands would have been variously tortured, or twisted so as to make them appear smaller than life; or else the fingers would have been artlessly spread out in order to duly display the glittering clusters of diamonds, or the latest fashion in costly mittens, or in curious gloves.



SURF AT LITTLE HARBOR. Catalina Island. By C. B. WAITE.

ENLARGED NEGATIVES.

BY J. HERBERT FRY.



"AM NIEDER RHEIN," By R. ED. LIESEGANG.

ONE of the shibboleths of photography has always been the superiority of the carbon transparency for reproduction purposes. One of the side lights—the incidence of which is often missed or neglected however—is that the enlarged negative is probably to be made by the "wet" process.

So long as this is the case the carbon transparency will probably—although not necessarily be the best for the purpose. The rationale of the process is a transparency process capable of rendering all the detail of the original in the most delicate manner, but depending upon a negative process in which the characteristics are of an opposite character. Thus the tendency to soften in the carbon transparency is counteracted by the inclination to boldness, and clear shadows in the negative.

With gelatine emulsion plates, however, it is possible to obtain either the bold or the soft character of gradation. Sometimes only the latter class of plate is available. In such a case a bolder transparency is essential to success and the carbon method can advantageously be exchanged for gelatino-bromide.

In cases where reproduction is required to alter the character of the original negative the use of a gelatino-bromide transparency may even be essential; because by no other method can the relative gradations of the original negative be so widely increased or decreased.

As regards grain, there is hardly a more noticeable or

effective grain in a good gelatino-bromide transparency plate than in a carbon one, and for enlargements of four to five diameters no difference on this head can be detected

The matter stands then that for enlarged wet plate negatives the carbon transparency will generally give the best results. For dry plate negatives the class of transparency must depend upon whether "brilliant" or "soft" plates are used in the final process. For the former the carbon transparency will still be the better, for the latter gelatine will probably give the most satisfactory results.

Upon the larger question of gelatine or collodion for enlarged negatives, there are so many considerations to be taken into account that no dogmatic statement can be made. That "wet" will survive another generation of workers for this particular purpose may be held to be very doubtful. When gelatine plates come in for enlarged negatives it will be found most convenient to use them of a soft and fairly rapid character, and such plates will require a bold transparency. This must be made in gelatino-bromide. Then the carbon transparency will be practically a thing of the past. It will be remembered like the "good old times," with apparent affection, but it will be superseded.



"DAISIES." By Mrs. D. M. STEVENSON.



"What is your fortune, my pretty maid?"
"My face is my fortune, Sir," she said.

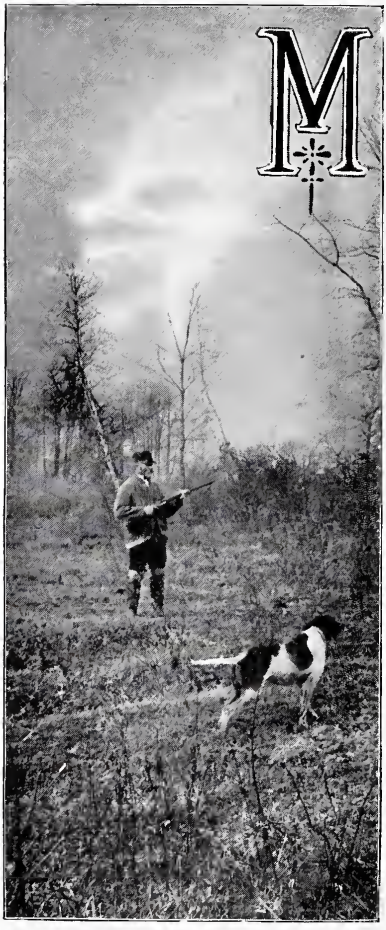


"Then I'll not marry you, my pretty maid."
"Nobody axed you, Sir," she said.

BY MAJOR R. H. BROWN.

A PLEA FOR RETOUCHING.

BY W. J. HICKMOTT.



A NOVEMBER MORN. By G. L. WILMS.

MUCH has been said in these days of artistic photography against the use of the pencil on the negative, and the occasional productions of special subjects where no retouching has been done receive so much consideration and praise, that a word in favor of that much abused practice may not seem out of place.

No one will deny that in many cases, if not most, the retouching is greatly overdone, and that the resultant print bears but slight resemblance to a proof taken from the negative in its original state as it came from the fixing bath, but for any professional photographer, in these days of particular customers, to say that hereafter no more retouching shall be done upon his negatives is equivalent to saying that in a short time he will suspend business. Singularly beautiful specimens of photographic art have been turned out where no retouching has been done on the negative, and these specimens deserve most richly the admiration they receive, but, at the same time, in the great majority of cases, these specimens are simply specimens, strivings after effects

in light and shade, and the photographer rarely receives orders for duplicates. In most cases they are studies, pure and simple, with no expectation on the part of the maker that they will serve any other purpose than to educate him in certain lines. A negative of life-size, or nearly so, of a strong and rugged face may well be left with little or no retouching, especially where it is on rough paper and may be viewed from a distance, and when so printed and so viewed the lines and wrinkles are softened and subdued and refined away, and the effect of the strong lines and the characteristic unevenness of the face presents a pleasing and artistic appearance. But this is not the method of treatment of most photographs. They are seldom hung upon the wall at a height of over seven or eight feet, and in the great majority of rooms must be viewed from a distance of not more than ten feet, and usually much less than this. Examined from so near a point the print is, to most people and especially to the original, anything but pleasing. Most people know little or nothing about anatomy, and care less about it. If they have hollow cheeks they want them filled out. If a young maid has a bony neck she wants it made smooth. What does she care about anatomy, and whether the resulting photograph compares with the original or not, so long as it is better. She don't want it like the original. It must be better; and the more it is retouched, and the smoother it is, the more pleased she will be. Could she have her way she would, undoubtedly, have been much better formed than it is possible for the retoucher to ever make her appear, no matter how skillful he may be. Nature having been unkind she seeks the retoucher's art to repair the wrong, and when this has been accomplished, if well done, and by this I mean that the lines are all gone, the cheeks softly rounded and the neck made smooth and voluptuous, an order follows, the photographer gets a good advertisement and his full price.

I have cited the case of a young maid because the bulk of the professional photographer's clientage comes from the gentle sex, and not because they are more particular in this respect than men. Indeed, I am inclined to think that men

are more particular than women. Life with them is a serious matter. They scowl over their breakfast, they scowl all day when at business, and they scowl all the evening over the newspaper except at rare intervals when they run across some joke that is still too young to vote, and then the look of grim determination leaves the corners of the mouth for an instant. Having dallied for years with serious matters it is by no means strange that photography with most men is no joke, and when they go, or are driven, to the studio, they go with a bull-dog determination to make short work of an exceedingly unpleasant business. They sit in the chair with an I'll-die-game expression, and it is of no avail that the photographer tries to induce the cast-iron face to relax even for an instant. The exposure is made, the proof submitted, and then comes the criticism : " I'm not such a low, truculent looking villain as that. I look like a murderer. Burn that thing and smash the plate and I'll come around some day and try again." That has happened weekly in almost every professional studio in the country. Now the retoucher gets in his fine work. He takes out the scowl and works out the grim expression around the mouth, lowers the high lights on the cheek bones, smooths everything up in fine style, takes off from ten to twenty years of hard and laborious life that has left its seamy marks behind, and Mr. Man gives one glance at the proof from this negative, gives an order, and pays the bill with pleasure. This also happens, but not, perhaps, weekly, in every studio in the country.

There is no use in trying to do away with retouching. The only thing is to do as little of it as possible and suit the customer. Of course, that is the main thing. They pay the money for the pictures, or photographs, and they have a right to say how they will have them finished. Educating the public up to the point of taking and paying for what they don't like is expensive and unsatisfactory work, and few photographers have the means to gratify their own particular notions in a matter about which, after all, they may be more ignorant than their patrons. It would seem to me that if a person of sixty years wants for any reason to be made to look as near thirty as possible, the nearer the



PROV. HELIOGRAPH CO.

"FRA GIOVANNI,"

By HORACE W. GRIDLEY.

photographer can come to hitting the mark the better it will be for him. The main thing, I take it, is that the photographer, being in the business not for the love of it so much as for a living, had best get his living in the easiest way possible for himself and with the most satisfaction to his patrons. When he has been in the business long enough and has reached that period of wealth and high art that enables him to be independent of labor of any sort, when he can produce nothing but art, both in the forenoon and in the middle of the day, and likewise in the afternoon, then he can invite people to come and sit for all the ugly studies a diseased mind can concoct, and he need not care if nobody likes them or will take them away either for money or without. The talk about anatomy and the falsity of a retouched negative, and all that sort of nonsense, is all right so long as you are doing business for fun and can get people to sit for you, but the time has not come yet when people will take and pay for monstrosities that bring on indigestion and nervous prostration every time they look at them.



HONELOS. Norway. By SIR BENJAMIN STONE, M.P.

BERNHARDT, THE CAMERA, AND SOME ANECDOTES.

(An Interview with Napoleon Sarony.)

BY GILSON WILLETS.



SARAH BERNHARDT. By N. SARONY.

SARONY has taken more photographs of Bernhardt than any photographer in this country, and has seen her in many and various moods. I asked Sarony, recently, what he would name as Bernhardt's chief characteristic, and his reply was: "Bernhardt rules everybody with a rod of iron but everybody loves her. I could never get her to come to my studio in time for the best light, and as a result my photographs of her do not do her full justice. She never kept an appointment; in fact, I never knew a genius who did. She would agree to get here at noon when the light was strong, but Her Majesty always kept me waiting till nearly four o'clock. She would come with her maid and several costumes, and when I protested that the light was bad, that I could not possibly do her justice, she would glance appealingly from me to the skylight and in a child's coaxing way would say in broken English: 'Beautiful light! oh! Tres bon light'; and when I still protested she would strike her heart tragically and in despair would wail 'Oh! You have no heart' Then of course I would yield, and she would again beam with pleasure. I had no need to pose her, for she was always tragic and would assume the character she wished to portray the moment she took the throne.



NAPOLEON SARONY.

FROM PEN DRAWING BY ISAAC MORGAN, CHICAGO.

"Bernhardt has posed for me in this same studio, her beautiful feet uncovered. She was actually as dramatic in the studio as upon the stage. In the character of Cleopatra I desired very much to catch her expression as she stamped upon the messenger who brought her unpleasant news from Antony. 'But I have no messenger,' she declared. Some one suggested her valet. She caught at the feasibility of the idea readily, and a moment later the astonished man was despatched behind a screen, with some drapery to array himself as the imperial news bearer. Bernhardt prepared herself in the usual way to receive him. When he appeared, the bottom of his trousers was visible below the drapery. Any other actress would have said in a matter of fact way: 'Take off your trousers. They are not consistent with the ancient costume.' Not so Bernhardt. 'Mon Dieu!' she cried dramatically. 'Mais otez vos culottes.'

"As I have said, Bernhard rules with a rod of iron, and yet every one loves her. For instance, one night, during her recent New York engagement, a prompter did not appear at his post until just before the last act. All the evening the great star, who knows the lines of all the characters in her plays, prompted her players herself. Just before the last act was called Bernhardt was standing on the semi-darkened stage looking over the lines of her part and silently running one hand through her hair. Suddenly a figure drew near. She perceived that it was the recalcitrant prompter, who with woe and repentance standing forth in his face, was about to plead for forgiveness. The tragedienne evidently paid no heed to the man's approach until he was within her reach, when, from the table by which she stood she suddenly siezed a large vase, struck the prompter a violent blow on the head, hurled the vase to the floor, and then calmly and in silence resumed the study of her lines and the running of her hands through her hair. The dazed prompter picked himself up from the floor, and with one long look of ineffable admiration and adoration at the intently silent star, proceeded to his post. Fortunately the vase was stage property and was made of papier maché—for if it had been real pottery the prompter would have had his earthly career brought to a

sudden and distinguished end. I asked Bernhardt why she struck the man as she did, and her only reply was 'He will never again fail to be at his post.'

"Again I have known the divine Sarah to compel a member of her company, a man, to fall on his knees before her and in the presence of several others, and grovel before her, beseeching her pardon for some trivial offense. And these things will those about her do for her, and at her command, not because she rules with a rod of iron, but because those about her adore her.





Copyright, 1893. By NAPOLEON SARONY.

"Her own con-



ception of the situation is expressed in her own words when she said, 'They are my slaves—slaves to my gold.'

"But speaking of Bernhardt's characteristics, a student of physiognomy, with one of my photographs of Madame Sarah before him, wrote these conclusions:

"'Her's is a remarkable head and face. It is fascinating; it is powerful. The shape of the head is wonderful. It has no depressions, which would denote an inharmoniously balanced mind, but the length of the head from front to back through the centre is remarkable, even after due allowance is made for the mass of hair. The forehead beneath the fluffy "bang" is a beautiful one The eyes have an intensely penetrating gaze, which is not a keenly piercing one, however. The mouth is beautiful, with fine, clear-cut lines and an intensely expressive curve. The nose is finely cut, and is indicative of intellectual power. The predominating characteristics of the face are intensity and emotionalism.



Copyrighted, 1892. By Napoleon Sarony.

SARA BERNHARDT.

BY SARONY.

"Another friend of mine, a phrenologist, said of her photograph:

"Her top head on a line with the ear is very high. This denotes great determination, and, with her temperament, willfulness and probably obstinacy. She is headstrong and pertinacious. But as she is subject to so many caprices she could hardly be called firm. Continuity, which lies in the upper part of the back head, is quite deficient: and as her temperament is unfavorable to patience we may be sure that nothing could be further from her nature than prolixity or tediousness, either in thought or action. No one will doubt this who has ever seen her play. Her firmness being large and continuity small she persists in her purposes, but indulges in a great variety of methods. She resists opposition in any form, but allows her own forces to scatter as soon as the enemy retires from the field. Her energy and executive force are also largely due to the faculty of courage. She has little, if any, sense of fear. The prominent bridge of her nose, as well as the diameter of her head, vouches for her combativeness and love of adventure.

"Her head is very narrow at the seat of the hoarding impulse. She makes money to spend it, not to keep it. Of economy as an instinct she has almost no conception.

"Her forehead is well balanced and presents a good development in the regions of both perception and reflection. She appreciates both practice and theory. She will observe the tiniest objects with the precision of a photographic camera, provided she is interested to do so. Her ability to judge and remember the forms of things is probably the most remarkable faculty in her lower forehead. This is shown in the great width between the eyeballs. Memory of form is essential to all artists, and is a talent quite common among the French. Mme Bernhardt has also the arched eyebrows which betoken a fine sense of color, and she shares with Joseph Jefferson, and many others in her profession, the reputation of being a fine painter. Her forehead is wide at the temples. This signifies mechanical ingenuity and love of music. She has a large stock of ideas as well as



Copyright, 1891. By NAPOLEON SARONY.

sensations, and for the most part she does her own thinking. She is also mirthful and witty.

"Her hand, too, is said to be a most interesting study. Cheiro, the palmist, and other students of Cheirosophy have implored me often to get some good photographs of her hand while I have her before the camera. From my pictures of hands students have decided that hers is an ideal feminine hand. It is very symmetrical, velvety and flexible, and free from any suggestion of attenuation, such as the public have been accustomed to associate with the figure of the actress. The joints of the fingers have the smoothness which denotes a lack of order, the tendency to be governed by impressions rather than reason, and many other qualities characteristic of poets, singers and actors.

"This year, the fifteenth anniversary of her first visit to America, Madame Sarah looked as young as ever, her face and form were fuller, and even my camera could not make the world believe that she is now in her fifty-fifth year."

THE HAND-CAMERA IN A NEW ROLE.

BY H. EDWARDS-FICKEN.



"THE SIREN." By MISS K. G. SPINK.

OF the making of books there is no end, and every photographer may now become both author and artist and add to his library works unsurpassed in interest and of rare truth in the illustration. He will also be his own publisher and enjoy the ecstatic thrill of seeing his works grow under his own hand and eye to perfect fruition.

The hand-camera makes this possible, and opens up a new field for its use in the most delightful manner.

As generally used it is but a snapper up of ill-considered trifles that have but a passing interest in their disconnected sequence, and lose all interest in the passing.

Used, however, as the historian of one's experiences by flood and field, it becomes the instrument of power to preserve for all time the most interesting phases of travel, the occasional holiday, and the adventures that can never be repeated

I have before me, as I write, four volumes compiled by the aid of my hand-camera, that represent so much in interest and value, and have proved so entertaining and absorbing to others whose reminiscences were evoked by their study, that it would be hard to find their equal.

A description of one or two will be sufficient to point the moral. The first is a complete illustrated diary of a trip to Bermuda, and commences with the steamer "Orinoco" lying at her dock here in New York; then comes the crowd of friends on the dock waving farewell; the last view of



STUDY FROM LIFE.

BY R. ED. LIESEGANG.

New York as the steamer passed down the bay; scenes of life on ship-board, heaving the log, working about the boats, and interesting groups; then the first view of the Bermudas; the scenes of life and customs peculiar to Bermuda, the coral quarries, the lily plantations, the banana fields, the "Royal" palms, the buildings, the little cutters that pivot on their own heels in the opal-tinted waters about the coral reefs; bird's-eye views of the principal points of the islands: and last scene of all, the pilot leaving as the steamer left Bermuda on the homeward run.

These views were all taken by a four-by-five Scovill hand-camera many years ago, and are printed in platinotype, that most beautiful of all printing processes, and best adapted for illustration, with plate-sunk mounts, and wide margins, one to a page, and interleaved with parchment tracing-paper on which is neatly inscribed the references to the opposite pictures, sometimes historical, occasionally humorous, but always brief and to the point. In plain leather binding in portfolio style, this is a veritable edition-de-luxe, with its title in gold lettering on the cover. It was made leisurely and with the most intense satisfaction as it progressed, and forms a souvenir of inestimable value. To those who have made the same trip it has proved simply absorbing.

Contrast this permanent result with the usual manner of travelling with a hand camera; the perfunctory photographing of a bit here and there in the absence of a definite aim, the subsequent mounting of the prints on loose cards, this one lost, that one given away; and consider the new interest awakened by the endeavor to use the camera intelligently from day to day to form a consecutive history to one's movements and enjoyments.

If it were necessary to strengthen the moral I might describe another volume on the same lines, the history of a cruise on a friend's yacht. The first picture, the yacht itself; then the view of New London as we sailed away; the accompanying yachts around us; the morning plunge from the yacht's side; the Commodore's flag ship; the dingy and launch races; the group of friends on the yacht; the enormous cod captured on Van Wagoner's shoals; the owner at the

wheel in a stiff breeze, with the lea-rail awash; scenes at Marblehead and Newport, and finally the farewell of friends over the yacht's side as one left to return to town.

For a contrast again to this delightful souvenir, gotten up exactly in the same manner as the other, which has interested and amused all who have turned over its pages, I may mention there was another camera on board, which in the absence of any definite idea of its owner, snapped here and there with the usual result of a couple of dozen disconnected pictures, which soon lost all interest in the absence of explanatory note or sequence of story, as I had personal opportunity of knowing later, as well as the amazed admiration evoked in looking over the volume I have described, by this same gentleman, who could hardly be made to believe it was the same cruise thus pictured and written up which he had photographed in his way, and who frankly acknowledged the wonderful opening of his views as to the real value of a camera.

One need not go far from home to find an object in such compilation, and for the making of a book of universal interest, and I will frankly add what I am now engaged upon, the opportunities being the same for any one to be availed of. This is a collection of street scenes peculiar to New York; the organ-grinder with his accompanying crowd of dancing children, the old sailor with his mechanically heaving waves and ship, the newsboys gambling on the pavement, the old women news-vendors at certain well-known corners, the Italian fruit sellers with their hand-carts, the flower sellers and the tramp loungers in the parks, contrasts of riches and poverty such as one may see every day, in fact the lights and shades of this great city.

I do not expect to accomplish all I desire in a day, nor a month, but the interest of it is exciting and continuous. With a small camera and a lens of universal focus it is not difficult to secure the desired pictures, and the hunter's quest for game cannot be more strong or alluring when the trail is once started.

In future outings carefully consider the field you will cover and what will best work up into something worth pre-

serving. Keep the fact in your mind that you are now making photographs with a set purpose and that there should be some logical sequence to them, and that you intend to make a book of them. You will soon learn two things: you will avoid taking a great many pictures you would otherwise waste many a plate or film upon; and you will actually be hunting for the best views possible to obtain.

If these suggestions awaken any new ideas to the idle camera holder, he will learn to love his camera, and cease to regard it as a mere toy for chance amusement.

A HITHERTO LITTLE KNOWN PROPERTY OF CYANIN.

BY DR. VICTOR SCHUMANN.



By P. BERGON.

YANIN is one of the most interesting sensitizers. Not only because it renders bromide of silver gelatine sensitive to yellow, orange-red and dark-red, but it has also, as I first learned in 1889, the power of transforming a negative into a positive or of reversing the image. This reversal with cyanin is certain and simple. The positives obtained in this manner, however, are somewhat weak; lacking in intensity. They never attain the intensity of a normally developed negative on the same plate.

Plates of this class require a special emulsion and special preparation. For this purpose a pure bromide of silver gelatine is chosen, to which before digestion (1 hour at 40 degs. C.) is added an alcoholic solution of cyanin 1:500, in the proportion of 50 minims to each 196 c.c. It is then poured into a dish and allowed to set, and left to ripen for several hours. It is then washed and melted, 5 per cent. of absolute alcohol is added and for the best results the plates coated immediately. It is not necessary to use extreme care to protect the plates from the dark-room light, as they are not very sensitive. They become so, however, immedi-

ately on bathing them, when dry, for one to two minutes in water to which 1 to 6 per cent. of ammonia has been added. After bathing the plates are set on edge on blotting paper to dry, and carefully shielded from the light. They can be exposed as soon as dry. They work then cleanest and best. If kept for some time after bathing, they fog easily and the more the longer they are kept. If during development, before the image is entirely out, the plate is exposed for several minutes to light rich in yellow and red rays, on continuing the development, the half developed negative becomes a positive.

The ordinary dark-room lantern is very suitable, for the second exposure. A 6 candle petroleum lamp placed at a distance of 1½ to 2 meters from the plate and unprovided with a ray filter works much better. I have not tried daylight. The capacity for reversal is much increased by the addition to every 100 cc. of the emulsion just at the time of coating the plates of 8 drops of a 1:10 solution of iodide of potassium. Bromide of potassium works much feebler and still more so chlorate of potassium. The changing of the negative into a positive can be followed with the eye without difficulty as the transformation takes place slowly and regularly. If care is taken to expose the plate and in such a manner that the action of the light gradually diminishes from one end to the other, a plate is obtained, when fixed, showing all the gradations from a negative to a positive.



"WATER-LILIES." By Mrs. GEO. ADSIT.

ADAPTERS FOR LENS MOUNTS.

BY F. E. FAIRBANKS.



SUNSET. Mid-ocean.
By FRANK ATKINSON.

WHEN it is necessary to carry several lenses on a photographic trip, an extra front board for each lens means quite an addition to the bulk of the outfit. And often the amateur will not carry his assortment of lenses with him for that very reason, and is quite likely to return home without some pretty views, because the lens he has with him is not suited to take it.

A description of an arrangement that I have recently adopted may interest the readers of the AMERICAN ANNUAL.

I have four lenses of different sizes, and have taken the flange belonging to the largest lens and screwed it to the front board of the camera, there to remain permanently.

For each of the three smaller lenses, I have had made a ring of aluminum that screws on to the lens in place of its regular flange, and remains there as a fixture.



The outside circumference of this ring is threaded so that it just fits, and screws into, the large flange on the camera.

The screw threads are cut so that when each lens is screwed home, it is "diaphragm slot up," as it would be if its own proper flange was used.

This adapting ring is represented by A, and A′, and the permanent flange by B, and B′, in the cut.

Being made as they are, of aluminum, the rings are very light, and add no appreciable weight to the outfit.

The lenses may be packed safely and compactly, in a case of their own, and carried very conveniently, and each lens is instantly available for use when it is wanted, as it is simply a question of taking one lens off from the camera, and putting another one on.



Copyrighted 1895.
By Baker's Art Gallery, Col., O

"MAID OF THE ORIENT."

I may also add that the expense of making the adapters was quite moderate. The arrangement is so simple, and its advantages so evident, that I presume that the same idea may have occurred to many others. But I have never seen it used before, and never saw it described in any photographic publication, and so venture to bring it to your notice.

A HOT STYLUS FOR ENGRAVING PHOTOGRAPHIC PLATES.

BY OLIN H. BASQUIN.

(*Physical Laboratory, Northwestern University.*)



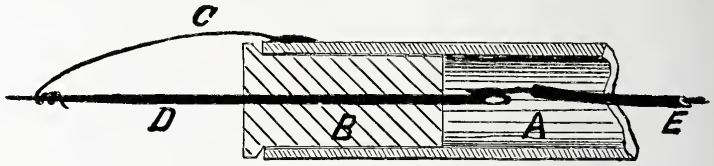
THE YOUNG CARPENTER.
By H. G. READING.

HAVE had occasion to engrave numbers upon gelatine plates so that prints taken from them will show the numbers in black. This involves a transparent figure upon the negative. Gelatine at ordinary temperatures is too hard and too brittle to engrave with ease, but becomes very soft and easy to work if heated. Hence, it is evident that the engraving can be done with a needle which is hot enough to soften the gelatine with which it comes in contact.

The needle described below is very simple and does good work.

(A) is a brass tube about four inches long and of about the diameter of an ordinary penholder. Into one end of this is fitted the hard rubber plug (B), and to the same end is soldered the small German silver wire (C). A hole is bored through the axis of the plug (B) just large enough to receive the steel sewing-needle (D), the point of which is to act as the hot stylus. Near the point of the needle is wound (not soldered) the free end of the wire (C), and to the other end is soldered a small insulated copper

wire (E). Now, if an electric current of about one ampere is introduced through the wire (E) and passed off by a similar wire (not shown in the cut) soldered to the brass tube (A), it will generate enough heat in passing from the needle to the German silver wire (C) to keep the needle-



point very warm, and render it capable of plowing a small furrow through the gelatine film with great ease. The current can be obtained from a small storage battery, or one or two Edson-Lelande cells, or the current passing through a 50 volt 16-candle power electric lamp may be used in series with the lamp.

PHOTOGRAPHIC NOTE BOOKS.

BY FREDERICK J. BURNETT.



THE OLD OAKEN BUCKET.
By F. J. BURNETT.

OF course, everyone who goes a voyaging to far countries nowadays takes a camera with him, or nearly everyone, and brings back a pictorial note book, a photographic sketch book of his wanderings; of the strange countries, and peoples, and sights he has seen; and nothing that he can bring home will be a source of greater pleasure to him than his photographic notes. Whatever their technical or artistic shortcomings may be, they will carry him back to the scenes of his wanderings as no other trophies, or no *written* notes can do; and when he is telling his "tales of a traveler," the pages of his photographic note book will be a priceless boon both to recountor and auditors.



The Art Engraving Co., St. Paul Minn.

ALONG THE MOUNTAIN PASS.

BY FRED BOISSONAS.

Not everyone can make this sort of a note book; many are prevented from going beyond seas by reason of business cares, or by lack of the wherewithal, and some of us are never able to more than half cross our own country; but who does not now and then take a little journey, if of but an afternoon's duration? Then there is *one* journey everyone must make, and he who will take camera notes along the way on his little trips, and on the long life-journey that the little trips help to make up, with as much judgment as he would use his camera in foreign lands, will find himself the possessor of a photographic note book, or a series of them, which those of the globe-circler shall scarcely rival.

A print of the Coliseum or the Parthenon may be purchased at any picture store, but where can one buy a photograph of the quiet pool under the willows where he learned to swim, or the "old oaken bucket" from which he slaked his thirst that hot day in the country?

Who is there among us who cannot see pictures with his mind's eye for a negative of which he would gladly exchange dozens of those he has? Who that owns a camera does not wish he had owned it years before, when the haunts of his boyhood, the familiar places of his young manhood, that are so changed or so far away now could have been so easily taken? The view from one's office window may seem very commonplace now, but when the new street has been cut through or the old buildings that were so familiar have given place to a sky-scraper, or he has gone to manage the branch in a distant city, he would be exceedingly glad of a print of it. And when the "Deering's Woods" wherein he gathered walnuts has been "surveyed, platted and recorded" into an "addition" to the city, or a street or railway has been built across the place where the boys used to skate, negatives of those places would be numbered among one's treasures.

What Runnymede and Stratford are to the English race, what Plymouth Rock and Bunker Hill are to our branch of it, some spots on this planet are to every member thereof; and the place or building that association has hallowed for the individual is usually one for which the world at large cares too little to insure its preservation, or its representa-

tion on paper or canvas, and each one of us must attend to his own sacred spots if he would have visual memories of them.

It is as useless to bemoan lost opportunities as spilled milk, they are gone and come not back to us; but perhaps a thought of them may help us to recognize and improve those of the present ere they have slipped away to join the lost ones and increase the long series of mental pictures that tantalize every camerist because they can never be anything else to him.

Let us not neglect picture making, for by that we may make ourselves artists instead of artisans, but neither let us neglect while the opportunity is afforded, to make brief records of some of the homely things that surround us, some of the familiar scenes that are so accessible to-day but may be so unattainable to-morrow, that, twenty years hence, we would like to see or to have our children see, as they are to-day.



THE MIDNIGHT STORM. By F. M. TUCKERMAN.

PHOTOGRAPHING BLOOD CORPUSCLES.

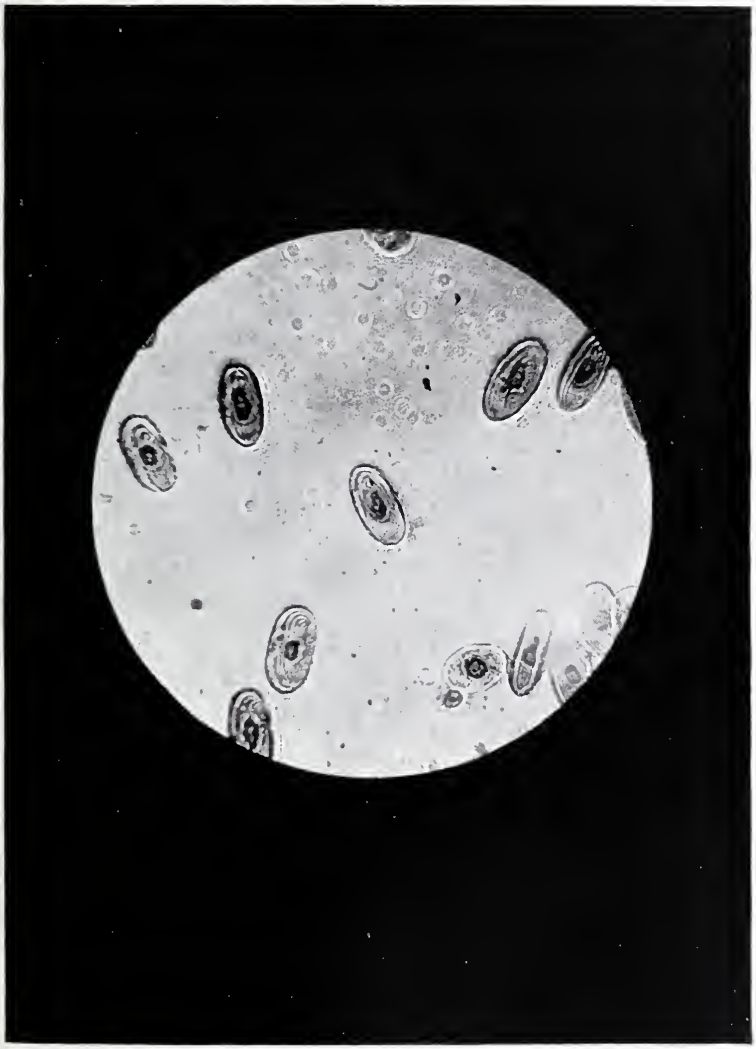
BY MAXIMILIAN TOCH.



By REUTLINGER.

IT is to be hoped that photo-micrography will be the means of establishing a test for distinguishing the blood corpuscles of various animals, but thus far, even though many so-called experts have sworn on the stand that they could tell the difference between human blood and blood of other animals which are regarded as identical, it is my firm opinion that these so-called experts have undertaken an obligation which is absolutely unwarranted. The illustration of the blood corpuscles of a young alligator, which is magnified 1140 diameters, shows several forms of blood corpuscles. That any other form but the oval one is an artofact is indisputable, and that artofacts are unavoidable is likewise obvious. The nucleus of the corpuscle shown in the illustration was stained with methylene blue and the protoplasm was stained with eosine, yet the photograph taken on an orthochromatic plate (Wuestner) in connection with an aurantia screen shows a proper distribution of the color value.

Human blood has no nucleus, as far as is known at present, and shows no unique markings or reticulations which distinguish it from the blood of hundreds of mammals. Some investigators claim that if human blood is treated with a solution of potassic dichromate the protoplasm is dissolved, and the fibrous structure or the reticulum remains behind and leaves the corpuscle in the condition of a sponge. This is the subject of much controversy, as the



BLOOD CORPUSCLES

OF A YOUNG ALLIGATOR.

BY M. TOCH.

fact remains that such a procedure produces an artofact. I am indebted to Dr. H. G. Piffard for the specimen I photographed, but as the specimen prepared by him was dried, after shedding, in an oven at about a temperature of 180 deg. Fahrenheit, it is a question which I do not care to decide, whether the result is an artofact in a greater or lesser degree, or not.

The illustration was taken with a 1/12 dry lens, but a good immersion lens of high aperture would have produced a result giving greater definition.



THE FRIAR AND THE MAID.
By MARIO DEI FIORI.

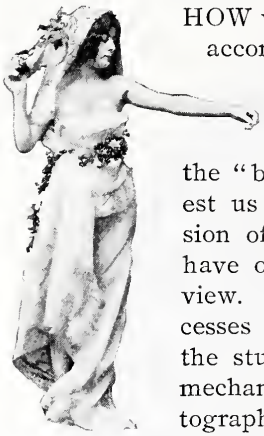


PORTRAIT STUDY.

BY J. K. RYDER.

NATURAL PHENOMENA ATTENDANT UPON AND ANTECEDENT TO EXPOSURE.

BY E. LINGAN BOWLUS.



By P. BERGON.

HOW varied and wonderful are the processes accompanying the simplest act or phenomenon of Nature, yet how much ignored by the amateur in his only sphere of action? As enthusiastic students of the "black art," we discover nothing to interest us in processes leading up to the impression of the picture upon sensitive film, but have only the end—the resultant picture in view. It is those antecedent, or primary processes that are most pregnant in interest to the student, who is not content with mere mechanical acquaintance with the art of photography, but who would inquire into the very nature of the processes themselves.

With this view in mind, viz: that of stimulating a desire for more intimate acquaintance with fundamental photographic processes, I call your attention to the "natural phenomena attendant upon and antecedent to exposure." We have here to do with ether vibrations—a form of energy manifesting itself under three distinct phases, which I have somewhat empirically generalized under three heads: external, intermediate. and internal light phenomena.

External Phenomena.—Under this head I refer to the physical aspect of light, *i.e.*, its rectilinear propagation and to its very nature, manifesting itself as a form of energy, and not of matter.

That light is propagated in straight lines, we know from experience, and needs no amplification.

That it is a form of energy is not so self-evident. When we speak of the use of energy (with particular reference to ourselves) we mean, in general, that feeling of resistance with which objects at rest oppose us, attempting to set them into motion and the longer the object, the greater the amount of energy used. Energy is therefore proportional to the

mass multiplied by the distance passed through, and is most apparent to our senses when matter is in motion. Now it has been shown by Roemer that for celestial distances light moves, and consumes time in the movement. We have here the factor of movement, and the just inference that something of a ponderable nature resisted movement, because time was consumed in the movement. This ponderable substance is the hypothetical ether which is to be regarded as an extremely attenuated and elastic form of matter; consequently when from some cause or other vibrations are set up in the ether, *i.e.*, when this hypothetical form of *matter* is set into motion, waves of energy result, and if they assume an incredibly small wave-length they are apparent to us as light. Now to return to the point. As stated above, energy is most apparent when kinetic.—*i e.*, the energy of a moving object. Therefore the conditions for the exhibition of energy are, 1st, the presence of matter; 2d, movement of the same; but these elements are present in light phenomena, as I have tried to make clear from Roemer's induction; therefore light is a form of energy.

Intermediate Phenomena.—While the above treats of phenomena external to the lens, there are other phenomena equally as interesting going on within the lens; *i.e. refraction*, the immediate cause of chromatic and spherical aberration.

No better explanation of refraction can be had than by comparing it to the passage of a column of men over smooth and ploughed ground. As the column encounter the ploughed ground, the increased difficulty of walking will cause it to bend. So it is with a ray of light in passing from a rarer to a denser medium (from air to glass), or *vice versa* (glass to air). In both cases light waves are impeded in their passage through the lens, and a resultant bending or inclination toward, or away from the surface normal follows.

The focal point to which these rays converge is not a definite point for all the rays impinging upon the lens, but there is formed a caustic curve for any one series of rays, or in other words, the surface in which all rays are in focus would be represented, approximately, by a concave surface. Such a surface is not furnished by the common ground-

glass screen of our cameras, and it is this that is the immediate, though not *ultimate* cause of spherical aberration, which is essentially an unequal focus, or dimness of objects near periphery of picture. The correction of this lens defect is the function of the diaphragm, or stop, which cuts off the more refrangible peripheral light rays.

Similarly the "chromatic aberration" is the unequal refraction of the constituent colors of white light, and is due to the inherent dispersive power of the prism-like, peripheral portion of the lens. This phenomenon is recognised by the colored edge of objects, thrown upon the screen by lenses not corrected for this defect.

Internal Phenomena.—By far the most interesting phenomena are those occurring within the dry-plate, ultimately resulting in the impression of the picture upon the sensitive film.

The forces at work here are inter-atomic, and therefore chemical in nature, *i.e.* they effect a change in the spacial relations of the atoms, or ultimate particles of matter, by energy applied between the atoms, using the latter as points of application. Thus the sensitive dry-plate film and indeed all matter, is universally regarded as made up of certain, fundamental, and indivisible forms of matter called "atoms." These atoms are aggregated into "molecules," and the whole imbedded in an all-pervading substance, the "ether." When these atoms form a stable compound their intra-molecular movement is a coordinated one, and together they form a solid system, or mass in which the molecule itself has a relatively large and characteristic spacial movement. Keeping the above in mind, we can now, in my opinion, easily account for the mysterious changes in the dry plate by means of the isochronal vibrations of the intra-corporal ether particles; for let these particles be set into violent vibrations, as in light phenomena, then this movement must be communicated to the atoms (of silver bromide in this case), and their original trajectory augumented until they come within other spheres of attraction, when a new arrangement follows, *i.e.*, new chemical compounds are formed. Therefore, according to this hypothesis, fundamental and









PORTRAIT STUDIES.

BY REUTLINGER.

radical changes, (therefore chemical in nature) are consummated by means of inter-atomic forces.

A second point bearing upon this division of my subject is: That an increase of photographic activity seems to be correlated in some mysterious way, with a deerease in length of the ether wave. The proof of this is experimental. Measurements of the wave-length of the spectrum colors show a gradual decrease in the length of wave from red to violet, but along with this decrease we have an increase of chemical, or photographic activity. Such is the testimony of experiment. The fact is to be regarded either as one of eoexistence, or to be explained much in the same way as I have attempted in the paragraph above.

With respect to the nature of the chemical action of light upon the dry-plate, all agree in regarding it as a *reducing* action, and this is conditioned by the presence, or absence of a halogen absorbent. A simple experiment will convince one of the reducing action of light, and consequent liberation of the halogen constituent. Prepare some fresh silver bromide (AgBr.) by treating silver nitrate ($AgNO_3$,) with potassium bromide (K Br.)

$$AgNO_3 + KBr = AgBr + KNO_3$$

Wash precipitate *well*, and expose under water to sunlight. When precipitate becomes quite dark, filter off the supernatant liquid, and treat it with silver nitrate for the presence of free bromine (Br.), which will give a milky precipitate of silver bromide (AgBr). To be sure of this, treat the milky solution with sufficient ammonium hydroxide, when it will clear up immediately. The action of light upon the silver bromide is to reduce it to a sub-bromide, and bromine.

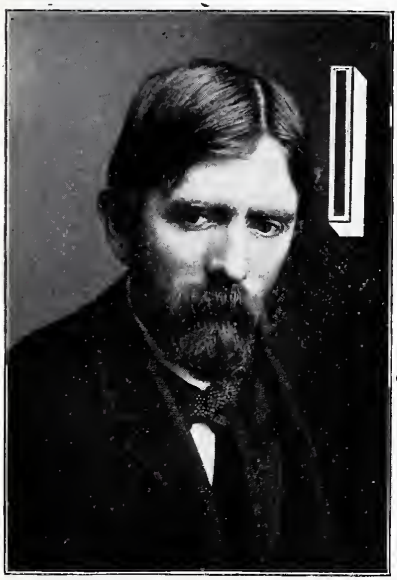
$$2AgBr = Ag_2Br + Br.$$

In this case the water is the halogen absorbent. In the dry plate the liberated bromine, at first nascent, in all probability reduces any organic compound of silver which may be present, or is absorbed by the outer surface of insoluble gelatine. If no absorbent is present an oxidizing action ensues.

THE PICTURE PLAYS.

BY ALEXANDER BLACK.

[ALEXANDER BLACK's "picture plays" have not, as some have suggested, been a result of Edison's kinetoscope and its successor, the vitascope. Mr. Black's "Miss Jerry," the first picture play, was planned and in process of making before the announcement of the kinetoscope, and before any attempt had been made to put the kinetoscope pictures on the screen. For the rapid succession of pictures having the same background there was the natural mechanical basis of the dissolving stereopticon. The effect produced by Mr. Black by the use of changed groupings with the same background was new with him; but the essentially new feature in the picture plays is the telling of a story through and with the pictures, the text playing an accompanying part.]



ALEXANDER BLACK.

IN completing my second picture play "A Capital Courtship," concerning which the editor of the ANNUAL has asked me to write a few words, I found it to be necessary to change radically certain processes which I had followed in "Miss Jerry." In "Miss Jerry" a large proportion of the text was written before the pictures were made. In "A Capital Courtship" a large proportion of the pictures was made before the text was written. My reason for making this change lay in the fact that I had adopted a more dramatic plan in "A Capital Courtship" than in "Miss Jerry." That is to say, the second story is more of a picture *play* than the former and required different treatment from the photographic standpoint.

No photographer will require to be told of the difficulties of grouping three, four or more people so as to produce



The Steps of the Capitol.



COL. WINFIELD.

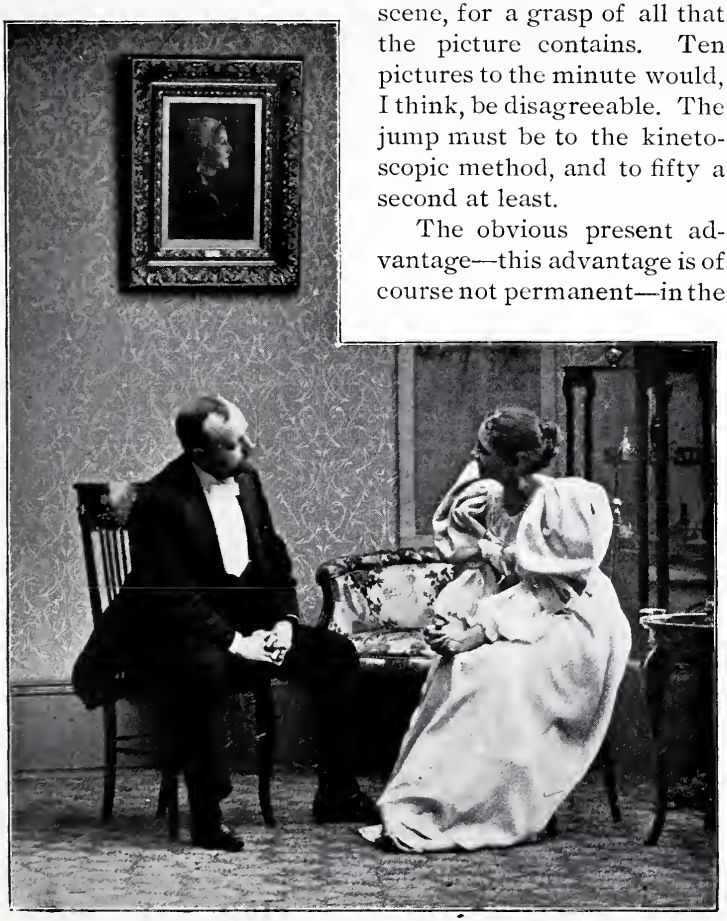
naturalistic action. When we add to the difficulty of a set picture of the *tableau vivant* order, the difficulty of producing the effect of natural action in pictures that succeed each other at the comparatively long interval of fifteen or twenty seconds, there are harsh limitations to overcome. Thus, it becomes necessary to suggest the more vigorous action as happening at the moments when the pictures are dissolving, and to leave the actual pictures to represent conditions, just before or just after violent action. In the scene at the Newport villa, for example, where Viola slaps Count Rudolph's face, it is necessary to choose the moment immediately after the blow and while the Count is standing aghast and confused.



Scene from "A CAPITAL COURTSHIP."
By ALEXANDER BLACK.

I think there could be no further compromise in time between isolated pictures as illustrations, and the rapid succession produced by the vitascope and kindred appliances. In either case the perfect quiet in movement necessary to the telling of a story, the complete obliteration of the mechanism of projection, is absolutely essential. Four pictures to the minute is not unpleasant to the eye. This number I produce with the dissolving lantern without jar or shock, leaving sufficient opportunity in the case of changed scene, for a grasp of all that the picture contains. Ten pictures to the minute would, I think, be disagreeable. The jump must be to the kinetoscopic method, and to fifty a second at least.

The obvious present advantage—this advantage is of course not permanent—in the



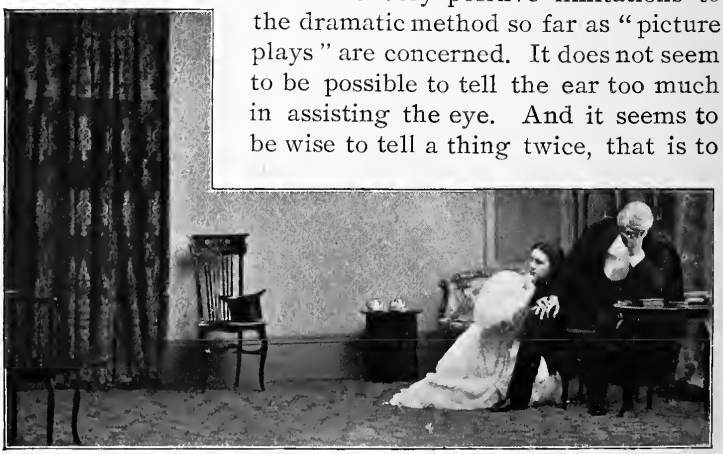
CAPTAIN HARTLEY AND THE WIDOW.



After the Letter.

use of ordinary camera pictures, is that they are made under a great variety of conditions and in a great variety of places, giving the interesting use of real back-grounds. Thus the dissolving set of pictures I made in the President's private office at the White House, the set made in the Speaker's room in the House of Representatives, etc., were made under conditions that would have precluded the use of more cumbersome apparatus, even had the obstacle of poor light been removed.

In making "A Capital Courtship," I have found that there are very positive limitations to the dramatic method so far as "picture plays" are concerned. It does not seem to be possible to tell the ear too much in assisting the eye. And it seems to be wise to tell a thing twice, that is to

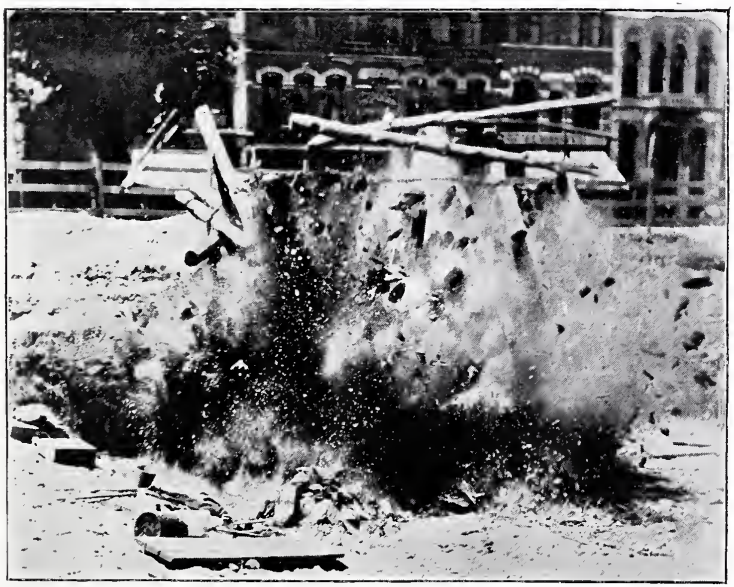


MIRIAM AND THE COLONEL

say, both through the eye and through the ear, rather than to leave an essential point to one telling when it may miss appreciation by the assistance of one of the senses only.

The studio pictures for "A Capital Courtship," were all made at much longer range than those for "Miss Jerry," with the result that I was able to use more naturalistic composition without danger of unpleasant distortion.

To the whole method there is the limitation that the rehearsal is the play—the first sketch is the finished picture, and the sins of a moment when work must be done rapidly and at high pressure on account of the models or actors, visit eternal punishment on the artist. This is a fact that conduces to my permanent humility.



A DYNAMITE EXPLOSION.

By OSGOOD PLUMMER.

SOME USES FOR CELLULOID FILM IN THE GALLERY.

BY J. W. BARBOUR.



"YOU SHAN'T COME IN." By HALL EDWARDS.

BUT few, I fancy, will deny that the discovery of transparent celluloid as a flexible substitute for glass was an important step in modern photographic development.

Every one knows what an important factor it is in the equipment of the hand camera, but there are some minor uses to which it can be put, and it is of these that I desire to treat in this article.

In the first place, a pleasant, softening effect can be produced in printing by interposing one or more sheets of the clear celluloid—old hand-camera films stripped of the gelatine coating will do—between the negative and the paper. As the transparent film can be cut to any shape, particular parts of a negative can be softened by covering them while the rest can print exactly as before; thus by cutting out a celluloid mask and fitting it around a figure, a harsh background can be softened while the definition of the portrait is left unchanged.

These same sheets of transparent film are also of much use in covering a negative when for any cause actual contact between it and the paper is not desired.

By moistening the surface of a transparent film with the

tongue it becomes "tacky" enough to be written on with a pen, and titles can be easily put to negatives by writing the words in this way and pasting the strip, face down, on the negative. No risk is run of spoiling the negative by a slip

Fig. 2.



Fig. 1.

of the pen as in writing directly on the gelatine surface, and the fact that the writing does not have to be done backwards will be appreciated by many.

Sometimes it is desired to make a copy from a weak and flat original, and here again the transparent celluloid film will help us in obtaining the desired contrasts. Two or more successive exposures are made on film from a hand camera roll, and the resulting negatives are superimposed and the prints made through them with the desired result.



Fig. 3.

One more use is in preparing negatives for combination printing, which I will illustrate by a practical demonstration.

In the group, No. 1, it was desired to insert the faces of three men, of whom cabinet heads, No. 2 were at hand.

The figures were first cut out and arranged against a black background, and were focused and adjusted till the image on the ground glass fitted into the desired place in the group negative held against it. The exposure was then made on a piece of Kodak film, and the resulting negative, cut so that the edges followed the outlines of surrounding objects in the original negative, was pasted on with the result in No. 3.

The edges of a piece of celluloid film, that covered but part of a negative during printing, will show slightly in the finished pictures, but if a little care is taken to shape them along well defined outlines in the original, they will defy detection.

There are, of course, quite a number of other uses to which celluloid film can be put. Many of these will readily suggest themselves to the thoughtful operator.



THE MOAT FARM. By M. HARVEY BROWN.



THE ROAD TO THE SEA.

BY TYSON & BRENGLE.

THE EFFICIENCY OF SHUTTERS.

BY JOSEPH COTTIER, A.M.



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MABEL LOVE. By FALK.

A SHUTTER, giving a gradually increasing area of opening for the passage of light during part of the exposure, and a gradually decreasing area during the remainder of the time, will evidently not let as much light act at a given point of the plate as it would if able to pass instantaneously to the position of full opening, remain in that position during the time of exposure, and close as suddenly as it opened. The ratio of the amount of light which is allowed to reach the plate during exposure, to that amount which should have been permitted to act had that shutter remained at the position of full opening during the whole time, will be called the "efficiency." For some reason this has, from some writers, also received the name of "co-efficiency." That a knowledge of this property of the shutter is important, may be realized when it is seen that with the same actual time of exposure some of the shutters on the market will give three times the effective amount of light of certain others; and that from 20 per cent. to 50 per cent. difference between the amounts of light reaching different parts of the same plate is not uncommon.



Fig 1.

Shutters naturally classify themselves into the two classes of diaphragm shutters, and shutters not placed at the diaphragm. The first class will give an even distribution of

light over the plate, if the lens is capable of doing its part of the work, whatever the shape of the opening; for no matter where an opening is made in the diaphragm plane, the whole plate is immediately covered. For the same reason, there is with such shutters no mechanical distortion of the image, due to one part of the plate being exposed at a later time than another, and when the moving object has changed its position. Shutters of this class are, however, subject to a dioptrical distortion if the opening is not at all times a single aperture, symmetrically arranged about the optical axis of the lens. The reason of this distortion is to be found in the larger "circle of diffusion" produced by a larger diaphragm opening, the "circle of diffusion" being the diameter of the image of a point not quite in focus. The true image of a line is, then, the focus of the centers of these circles of diffusion, so that if the shutter satisfies the above desideratum, like, for instance, diaphragm-shutters, or, indeed, all shutters formed of two or more vanes moving in opposite directions, the shutter opening, beginning small and central, and closing small and central, will give the center of this band of "image" the most exposure, and afford a satisfactory impression; while a shutter made after a certain French model, and working like a damper in a chimney-flue (see Fig. 1), would give the edges of the image of a horizontal line (with the shutter in position shown) more exposure than the center, and the general effect of a double exposure would be obtained. Although the effect is not so marked as in this last case, a single "drop" or

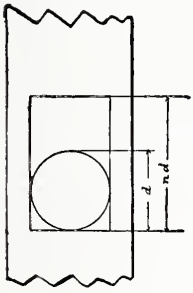


Fig 2.

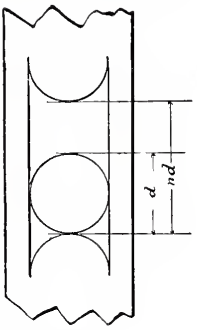
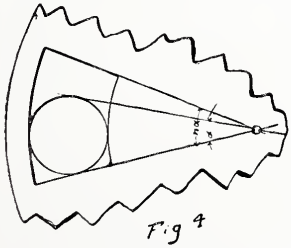


Fig 3.


Fig 4

"guillotine" shutter at the diaphragm is for the same reason not the best form for use. The following results will show that for shutters placed either in front of or behind the diaphragm, the only suitable forms for a uniform distribution of light are the drop shutter with the rectangular opening, and the rotating vane with a special form of opening.

Many of the cases here tabulated for efficiency at constant velocity have also been obtained by other investigators, a notable paper being that of Commandant Moëssard, Bull. Soc. Franç. de Photo., 1895; the remaining results are believed to be new. An apology is, perhaps, due for the few comments made on the results; but it is feared that a full discussion would take up more space than could be allowed to it in this Annual, and the reader is respectfully requested to make his own deductions.

DIAPHRAGM SHUTTERS.

Specification of Shutter.	Note.	Efficiency.	
		Exact.	Decimal.
Simple "Drop" or "Guillotine" Shutter			
Rectangular opening (Fig. 2); length of opening = n times diameter of diaphragm:	*a*		
for n = 1/2		1/3	.33
for n = 1		1/2	.50
for n = 2		2/3	.67
for n = 4		4/5	.80
in general		$\frac{n}{n+1}$	
Circular opening; diameter of opening = diameter of diaphragm	*a*	$\frac{4}{3\pi}$	.42
Bi-concave aperture (Fig. 3); smallest diameter along line of motion = n times diameter of diaphragm	*a*		
for n = 1/2		$\frac{9\pi - 16}{9\pi}$	.44
for n = 1		$\frac{3\pi - 4}{3\pi}$	.58
for n = 2		$\frac{9\pi - 8}{9\pi}$	.72
for n = 4		$\frac{15\pi - 8}{15\pi}$	.75
in general		$\frac{3\pi(n+1)-8}{3\pi(n+1)}$	

DIAPHRAGM SHUTTERS.—*continued.*

Specification of Shutter.	Note.	efficiency.	
		Exact.	Decimal.
Rectangular opening, constant acceleration. Length of opening = diameter of diaphragm	*b*		
Fall starts with opening edge of aperture tangent to upper surface of diaphragm opening			.38
Fall starts with lower edge of shutter opening one-half diameter above diaphragm	*c*		.48
Fall starts with lead of one diameter of free fall before exposure begins	*c*		.49
Single Rotating Disk Shutter.			
Radial edges to opening (Fig. 4). Angle included between these edges = n times angle between tangents from axis of rotation to diaphragm	*a*		
for n = 1		1/2	.50
in general	*d*	$\frac{n}{n+1}$	
Circular opening, diameter of opening = diameter of diaphragm	*a*		
Axis of rotation on circumference of diaphragm (see Fig. 5)		$\frac{\pi^2 - 4}{2\pi^2}$	.30
Axis of rotation 5/3 of radius of diaphragm opening from center of diaphragm	*d*		.41
Shutter aperture formed of reversed circular arcs, of radius equal to radius of diaphragm, and leaving free circular opening of size of diaphragm	*a*		
Axis of rotation on circumference of diaphragm (see Fig. 6)		$\frac{\pi^2 + 4}{2\pi^2}$	.70
Axis of rotation at 5/3 of radius of diaphragm from center of diaphragm (see Fig. 7)	*d*		.59
Two Vanes Moving with Equal Velocities in Opposite Directions.			
Rectangular opening, length of aperture in each vane = n times diaphragm opening (Fig. 8)	*a*		
for n = 1		$\frac{3\pi - 4}{3\pi}$	.58
for n = 2		$\frac{3\pi - 2}{3\pi}$	.79
for n = 4		$\frac{3\pi - 1}{3\pi}$	.89
in general		$\frac{3\pi n - 4}{3\pi n}$	
Circular openings, diameter of openings = diameter of diaphragm	*a* *e*	$\frac{4}{3\pi}$	.42

DIAPHRAGM SHUTTERS.—*continued.*

Specification of Shutter.	Note.	Efficiency.	
		Exact.	Decimal.
Two Vanes, not Making Complete Passage, but Opening Fully and Returning.			
Velocity uniform in both directions, results may be found from previous case ...			
Motion "harmonic" in both directions, return immediate; diameter opening = diameter diaphragm.....	*f*		
Rectangular openings.....			.51
Circular openings.....			.49
Iris Diaphragm Shutter.			
Maximum opening of shutter = diameter of diaphragm; shutter remains full open a fraction n of the whole time of exposure. Velocity uniform.....			
for n = 0		1/3	.33
for n = 1/2.....		2/3	.67
in general		$\frac{2n+1}{3}$	
Harmonic variation of velocity.....	*f*		
for n = 0		3/8	.38
for n = 1/2.....		11/16	.69
in general		$\frac{5n+3}{8}$	
Damper Shutter (see Fig. 1).			
Velocity uniform.....	*g*	1/3	.33

NOTES.

a. Velocity of motion of vane is uniform.

b. Constant acceleration of velocity; this is the case of a freely falling drop shutter. If the velocity is further increased by the addition of a spring, the motion will approximate to this, but approach somewhat nearer the case of uniform velocity if the tension on the spring decreases sensibly toward the end of the motion.

c. From which it is seen that if a free fall of more than 1/2 diameter of diaphragm is permitted, the efficiency is sensibly equal to that at constant velocity. It should be remembered that the greater the fall before exposure commences, the greater the velocity, and the shorter the exposure.

d. In the case of radial opening, the rotating vane and drop shutter give the same efficiency; and as constructional difficulties rarely permit the center of rotation to be placed nearer than 5/3 of a radius from the center of diaphragm, the rotating vane shutter may be considered as of the same efficiency as the corresponding type of drop shutter.



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AMY BUSBY.

BY B. J. FALK.

e. Although the efficiency is now the same as for the simple drop shutter the distribution of the opening is more symmetrical, and, as the distance each vane must move is only 1/2 as great as before, the actual time is 1/2 its value for a simple "guillotine," the velocity of the vane being the same in both cases.

f. By "harmonic" variation of velocity is meant a velocity beginning at zero, increasing to maximum at mid-passage, and decreasing to zero at end of path, the velocity varying as a sine or cosine function of the distance: a pendulum of small arc has sensibly this motion. This law probably represents closely the actual motion of the two cases analysed.

g. Given on authority of Moëssard, "Bull. Soc. Franc. de Photo.," 1895, p. 220.

Shutters not Placed at Diaphragm.

No shutters made of two or more vanes opening centrally are suitable for use in this fashion, for (Fig. 9) the central pencil of rays B would be able to pass through the shutter for a much longer margin of the pencils A and C from the time than the picture.

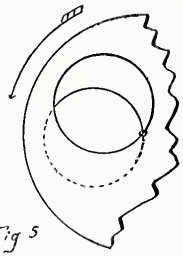


Fig 5

The only really suitable form of opening for a drop shutter is the rectangular; for a shutter with circular opening will evidently give less exposure to those edges of the plate which are parallel to the direction of motion than to the central portions; and a shutter of bi-concave opening will give a greater exposure to these edges. Such a shutter may, therefore, be of much use, if judicially used, in correcting the errors of a lens which has a tendency to give a "flare spot."

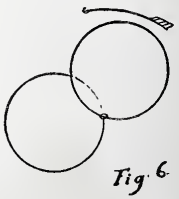


Fig 6

As the shutter may be considered as exposing each bundle of rays A, B, etc., separately, the efficiency will be as before,

$$\varepsilon = \frac{n}{n + 1}$$

where n is the ratio of the length of opening in shutter to the diameter of the bundle of rays at that point. If placed in front of the diaphragm, and the object so distant that each pencil may be considered as

made up of parallel rays, this diameter is exactly equal to the diaphragm opening in a landscape lens, and sensibly so in a compound lens. The efficiency is, therefore, the same at whatever distance the shutter be placed in advance of the objective, the opening remaining constant, being equal to that for the shutter at the diaphragm.

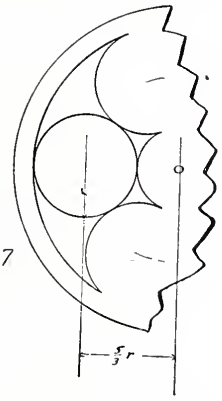


Fig. 7

If placed between lens and plate it should be noticed that the diameter of the pencil, now convergent, varies from zero at the plate to a diameter sensibly equal to the diaphragm opening at a distance in front of the plate = the focal length of the lens. Hence the following table:

Distance of plane of shutter in front of plate, measured in terms of focal length.	Efficiency. Rectangular opening; length of aperture in terms of diameter of diaphragm =				
	2	1	1/2	1/10	n
9/10 f.	.69	.53	.36	.10	$\frac{10\,n}{9 + 10\,n}$
8/10 f.	.71	.56	.38	.11	$\frac{5\,n}{4 + 5\,n}$
5/10 f.	.80	.67	.50	.17	$\frac{2\,n}{1 + 2\,n}$
1/10 f.	.95	.91	.83	.50	$\frac{10\,n}{1 + 10\,n}$
5/100 f.	.98	.95	.91	.67	$\frac{20\,n}{1 + 20\,n}$
2/100 f.	.99	.98	.96	.83	$\frac{50\,n}{1 + 50\,n}$
1/100 f.	.995	.99	.98	.91	$\frac{100\,n}{1 + 100\,n}$

Although, as was before observed, the efficiency of a shutter is not sensibly affected by the variation of velocity of a freely falling drop shutter, if a small distance of free fall is allowed before exposure, the successive exposure of the different portions of the plate by a "guillotine" placed before the diaphragm, gives a very undesirable distribution

of light. Thus, if, for example, a shutter with opening three times the diameter of diaphragm, and placed at such a distance in front of diaphragm as to just cover fully the plate at mid-passage, be taken, and be allowed to fall freely a distance of one radius, or one-sixth of its opening, before exposure, the constant acceleration of the shutter would cause the sky to receive 1.39 or about 7/5 as long an exposure as the foreground. If placed between lens and plate, or made to accelerate *upward* instead of falling downward, the distribution would be much better, the foreground then receiving the greater exposure.

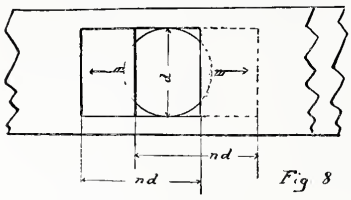


Fig 8

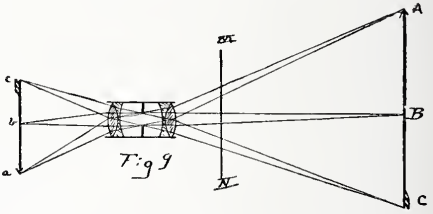


Fig 9

The rotating vane shutter, with radial opening and moving at constant velocity, also gives an uneven distribution of light, owing to the different efficiencies of portions thereof at different distances from the axis of rotation. Thus, if a shutter with a radial opening in which might be inscribed a circle of three times the diameter of the diaphragm be placed at such a distance in front of the lens as to just completely cover the plate at mid-passage, the axis of rotation being at a distance of three diameters from the center of diaphragm (Fig. 10) the edge of the plate farthest from the axis of rotation will only receive 5/6 the amount of light of the edge nearest to the axis. A shutter may easily be made that with uniform velocity will give a uniform distribution, by changing the sides of the opening from radial lines to appropriate curves; but it would seem that the shutter with radial opening, and *axis of rotation* directly *above the center-line of the lens*, the shutter being in front of lens, would give a much better result, the sky then receiving slightly less exposure than the foreground.

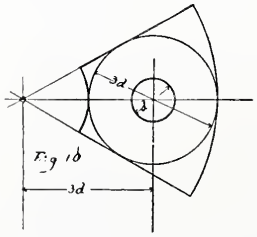


Fig 10



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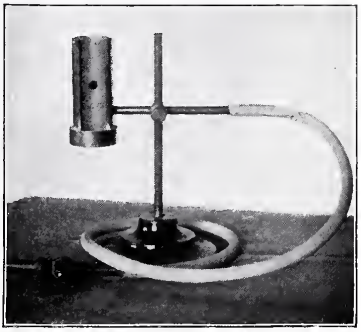
"THE AWAKENING."

By A. MORENO.

ACETYLENE IN PHOTOGRAPHY AND PHOTO-MICROGRAPHY.

BY W. H. WALMSLEY.

ALTHOUGH the superlative qualities of the Acetylene light for general illuminating purposes are now fully conceded, and its use is rapidly becoming more and more general, there are many purposes for which it seems pre-eminently adapted to which but little attention has been given. Foremost among these is its adaptability to portrait photography and photo-micrography. For both these purposes, as well as for copying and enlarging by means of the camera, it seems to be unequaled by any other artificial illuminant. Its actinism is very high, the light, as shown by the spectroscope, being almost identical with that of the sun. It is, also, very diffusive, and may be so controlled and disposed by simple appliances as to give a soft and harmonious illumination of the subject, equaled only by that obtainable in a perfectly appointed studio by daylight. There is a total absence of the harshness and violent contrasts so observable in negatives made by the electric arc or magnesium lights.

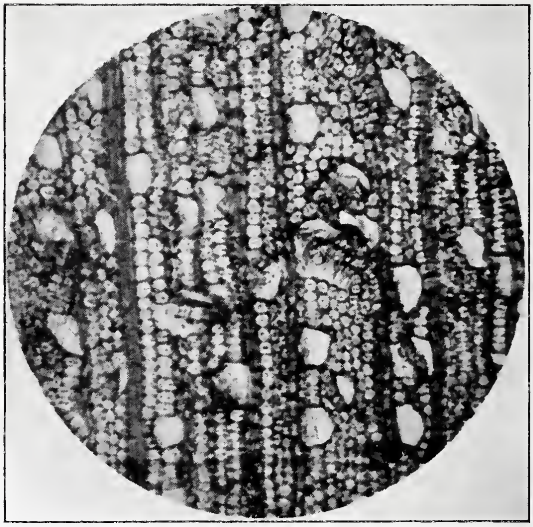


Acetylene Lamp for the Microscope and Photo-Micrography.



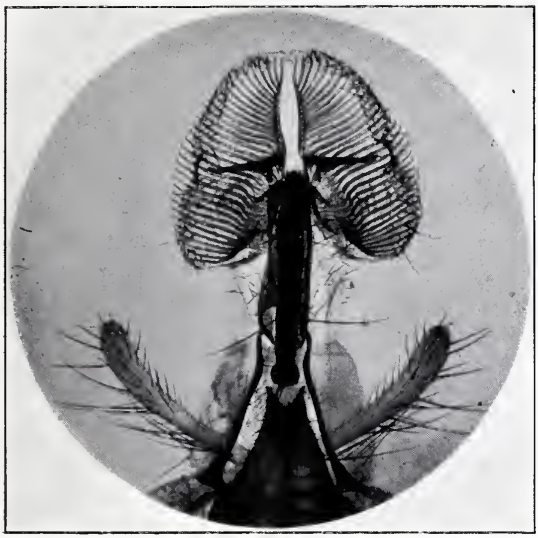
Triple Acetylene Lamp for Photo-Micrography. (One-sixth actual size.)

My first experiments with Acetylene as the illuminant in photo-micrography having been eminently satisfactory, I determined, during the past winter, to test its capacity in portraiture. Having had no experience in this line of work, I called upon my friend, Mr. X. O. Howe, the



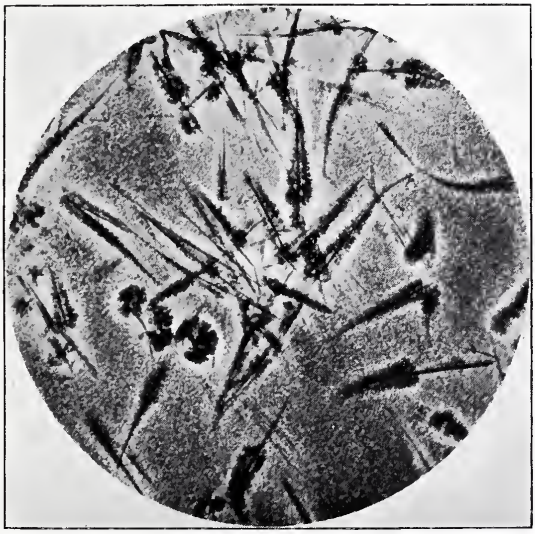
Dogwood. Transverse Section + 75 (Negative and Print by Acetylene Light). Micro Burner. 2-3 in objective. 30 seconds.

eminent photographer of this city, with the request that he would attend to the posing of the subject, the disposition of the light and the exposure; to which request he most kindly and readily assented. The Acetylene was furnished by a Fuller "Monitor" Generator, of small size. The lights were arranged on portable tripods, adjustable to different heights, and could be used in groups of four, eight, twelve or sixteen burners, being connected with the generator by flexible tubing. Tissue paper screens for diffusing the light were provided, as well as large cardboard reflectors. A very considerable number of exposures were made, under varying conditions and on different subjects, with the most satisfactory results. The lens was a Ross Universal Symmetrical of 16 inches focus, stop *f*/11. With eight burners, an entirely satisfactory exposure was made in two seconds. A still better one, beautifully lighted, was made in four seconds, with the light from four burners only. Mr. Howe was enthusiastically pleased with this work, which he declared could not have been excelled by the best daylight exposure. His satisfaction was more emphatically demonstrated by an

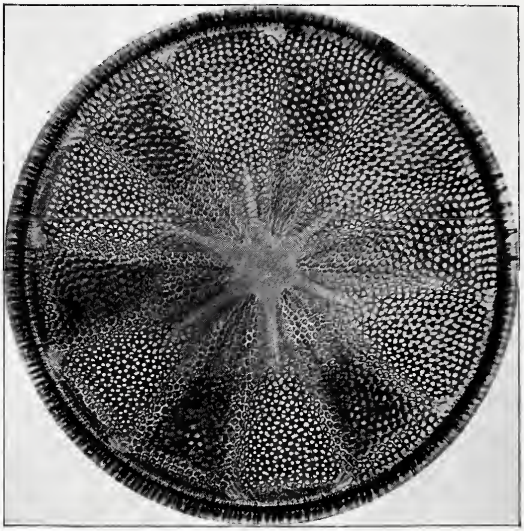


Proboscis of Blow Fly + 20 (Negative and Print by Acetylene Light). 11-2 in. objective. 20 seconds.

immediate order for his gallery to be fitted with a generator and the necessary burners, etc. This was completed some months since and is in daily use; the only instance in the world thus far, I believe, of the employment of Acetylene in a photographic studio. That it will have very many followers admits of no doubt. The comparatively insignificant cost of the outfit, its cheapness of operation, its simplicity and efficiency, together with the fact that sittings may be made as well by night as by day, are all factors in compelling its use by photographers every-



Section of Pitch Stone with Microliths + 75 (Negative and Print by Acetylene Light). 2-3 in. objective. 30 seconds.



Actinophychus-Heliopelta + 210. Sun Shield Diatom. 1-5 objective. 5 seconds.

where. In addition to negative making, Howe uses Acetylene for enlargements, of which he makes a great many. It is so satisfactory for this purpose that he has entirely discarded solar printing, and is thus independent of time or weather. His outfit is very simple. A Walmsley, Fuller & Co.'s "Monitor" Generator No. 3 furnishes the gas. To this is added a small gasometer, holding some seven or eight cubic feet, which can be filled at leisure and always have that supply on hand in addition to the gas that can be rapidly furnished as generated. This was done in order to save room, as he can thus use a very small-sized generator. The disposition of the burners, screens, etc., is after his own plans, which can be modified to suit the ideas of anyone. The whole affair is entirely satisfactory to him, and I believe it to be only the beginning of an extensive use of Acetylene in photographic galleries. The ability to make perfect work at a nominal cost with Acetylene light will, in very many localities, render the night-work of a gallery more important and profitable than its day service. Progressive photographers

will quickly adopt this light, which is no longer an experiment, but an assured fact.

Acetylene is a boon to the photo-micrographer, which he will fully appreciate and be thankful for. Undoubtedly, direct sunlight is the *best* illuminant for this work, but to how many is it available? The great majority of the workers in this field of photography never can employ it. The lime-light has hitherto been second only to the sun; but, again, very few are able to employ its services. Only the ill-smelling, at times smoky, and always unsatisfactory kerosene or petroleum lamp remained. It had one merit, that of being always available. Its yellow light (very suitable for some subjects) is quite the opposite for the great majority, rendering long exposures necessary, and thereby adding to the chances of a blurred or unsatisfactory negative as a reward for their labor.

The introduction of Acetylene, and a simple apparatus for its generation from crystalline calcic carbide, have practically placed sunlight within the reach of every photo-micrographer; and to work with it is a pleasure unknown to the user of the old oil lamp. Its pure white flame illuminates the object most brilliantly, and its actinism is so great that the length of an exposure is reduced to one-fifth, or even one-tenth, of the time required with a kerosene flame. Any of the ordinary burners, consuming from ¼ to 1 cubic foot per hour, may be used, but should be inclosed in a casing of some kind to ensure steadiness, especially if the edge of flame be employed. Hon. A. A. Adee, of Washington, whose beautiful work I have never seen excelled, uses a one-foot burner with edge toward the condenser. The flame is inside a small sheet-iron case, with a glass front. It burns with the utmost steadiness. I get practically the same results with a much less consumption of gas (1/10 c. f. per hour), by using a small round flame, about the size of a quill, inside a metal casing with front made of a glass microscope slide, 3 x 1 inches. This lamp I originally designed as an illuminator for the microscope, but finding that the intensely bright white light was eminently useful for photo-micrography have used it almost exclusively for that

purpose for a long time. At the suggestion of Mr. Adee, I have replaced the glass front with a slip of thin blackened brass having a hole one centimeter in diameter in its center, with good results. The illustration shows the general form and construction of this little lamp. A modification of this illuminator is shown in the second illustration. In this are three burners, one behind another in a straight line, with intervening diaphragms. A very great intensity of light is obtainable by this arrangement, for the idea of which I am indebted to Dr. Sternberg, Surgeon-General of U. S. Army, who used it with ordinary street gas. A description of it may be found in his valuable work on Photo-Micrography. For generating the Acetylene the smallest size of Walmsley, Fuller & Co.'s "Monitor" Automatic Generator may be used.

It is my practice to use monochromatic light, obtained by means of a cell of cobalt blue glass placed between the light and sub-stage condenser of the microscope. This, of course, necessitates longer exposures, but the better results more than compensate for this. Both negatives and prints of the four illustrations accompanying this article were made by the Acetylene light. For the negatives it was rendered monochromatic, as above stated. The prints were on velox paper exposed a few seconds to an Acetylene burner. The diatom (Heliopelta), though made with the highest power, required much the shortest exposure, being nearly colorless and exceedingly transparent. The Proboscis of Blow Fly, with the lowest power, required an exposure four times as long, owing to the dark orange-brown color in portions of it. It will be noticed that the details of all parts are equally well brought out. Let any one, who thinks it an easy subject, try it with an oil lamp and no blue cell.

In concluding this little article, I feel it impossible to frame a better wish for the photo-micrographer who may chance to be among the readers of it, than for each and every one to have the pleasure of using Acetylene gas as the illuminant in his future work.*

* The first cost is inconsiderable, that of maintaining the light a mere nothing, its management as easy and much cleaner than that of a coal oil lamp.

HOW TO MANAGE SOME TROUBLESOME INTERIORS.

R. D. O. SMITH.

AN ENGINE ROOM which I have several times essayed, proved to be a very difficult subject. It is lighted in front and through a skylight. In front there are two very large windows and a large double door with glass panels. The floor is covered with brownish linoleum. The wainscoting is seven feet from the floor and the ceiling is paneled oak, yellow with shellac varnish.

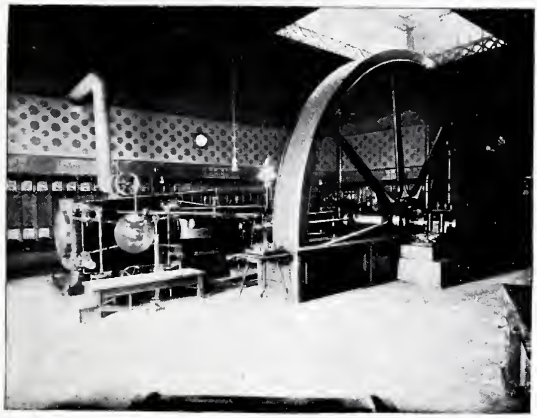


FIG. 1.

The floor gets a flood of light while the paneling of the ceiling is almost invisible. Photo No. 1 is about the best I was able to do by any method I had ever heard of, so I tried one I had never heard of, and which I am convinced is worth further trial, though I regret to say that I have not had time to carry it out systematically as I hoped to do before writing

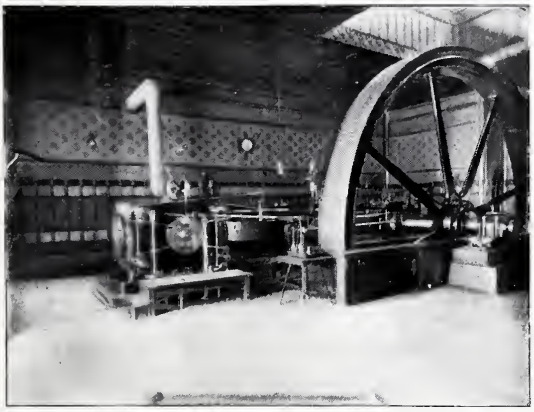


FIG. 2.

this. I shall not be able to do so, but I feel warranted by the success of my crude experiments to turn it over to others if it contains anything worthy.

I took a print from negative No. 1 and first cut out all the ceiling down to the bottom of the wooden cornice—leaving the rectangular skylight.



FIG. 3.

Then I cut out the face of the big wheel half-way up, and the highly lighted floor, engineer's platform and light end of pillow block pier. The ceiling was removed entirely and thrown away after serving to properly locate the part which contains the wall and engine in a little frame and the part which contains the skylight and the floor in another little frame. These two frames were separately hinged to a small board which I secured in front of the lens in such position that they would shut out the light from all the object except the dark ceiling. They were separately hinged, so that they could be separately turned down out of the way.

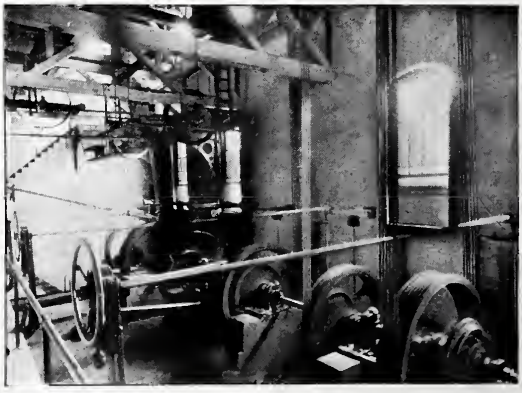


FIG 4.

Owing to the crudeness of my preparation I did not get these screens perfectly placed, but it will require quite a sharp eye to detect the missmatch.

Having made my preparation I covered the space between the frames and the camera with a camera cloth, and exposed my plate, on the ceiling, for about ten minutes. I then turned down the wall screen and continued the exposure for about three minutes, and lastly I turned down the screen which shielded the floor and face of the big wheel and continued the exposure for, say, fifteen seconds; then giving the

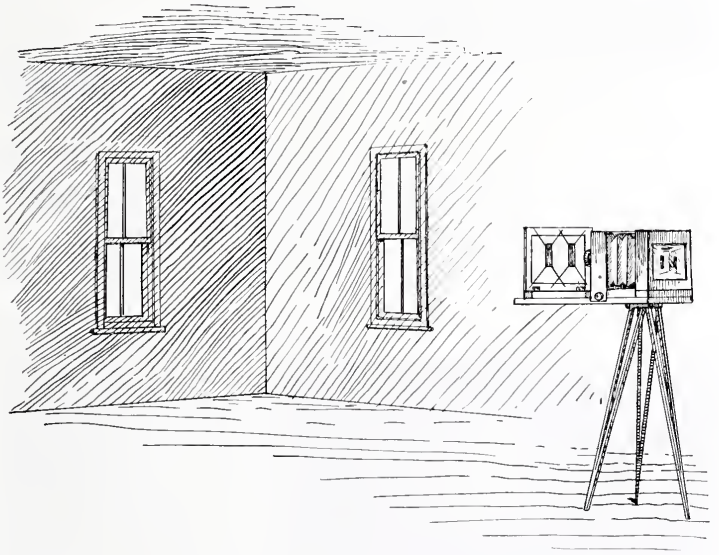


FIG. 5,

ceiling 13¼ minutes, the wall 3¼ minutes and the floor one-fourth minute. The product was photo No. 2, which while it is not all that could be desired by the critical, may nevertheless be fairly regarded as a success.

I next attacked the subject No. 3 where were no less than five windows facing the camera. Want of time prevented careful preparation of the screen which I employed, but yet I think in photograph No. 4, I succeeded well enough to show that results may be obtained in the way described.

Sketch No. 5 shows the idea.

It may not always be convenient to make a negative from which to get a print out of which to make a screen; generally but one will be needed, and that, rectangular in shape. So I propose to erect my hinged frame in front of

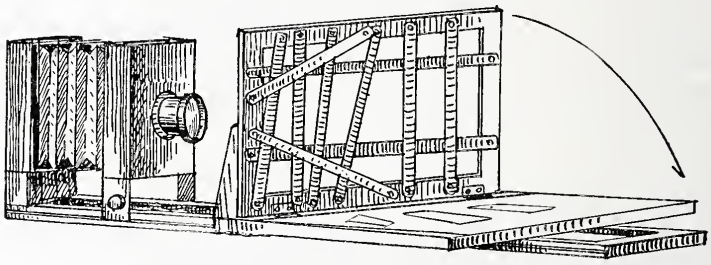


FIG. 6.

the camera, and place in front of the frame a flat board so arranged that the hinged frame will turn down flat upon it. Cover the board with a piece of paper if you choose.

Now set the frame up and attach to it strips of paper so that their edges exactly coincide with the margin of the window or other bright object to be screened. When this has been done the space within said edges will be exactly the form and size of the screen to be used. Turn the frame with its attached strips down upon the board and mark thereon the figure of the screen. Then repeat the operation for any other object or window to be screened, and you will finally have upon the board an exact plan of the necessary screen.



FIG. 7.

Cut from opaque stiff paper or cardboard the required screen pieces, lay them in place upon the board; turn the frame down and attach said screens to the frame by means of threads glued fast.

When the frame is erected again the screens will hide the bright objects and the exposure of the unscreened portion may proceed. When it has been progressed sufficiently far the screen may be removed without capping the lens and completed with full light.

If desired, a considerable number of screens may be employed and any desired tone illumination may be attained. In the case of the engine room I employed two screens and I think that a greater number would hardly ever be required.

Mr. Najah Taylor's article upon "Photographing Awkwardly Lighted Interiors" in *The Photographic Times* for last July, was quite interesting, but his results would have been vastly improved if at the end of the exposure he had capped the tube and raised the curtain from the window, and finished with an exposure of a few seconds of the lighted window. We would not then be in doubt whether they are curtains or a portiered door beyond the cabinet.

The example enclosed was made on a Carbutt orthochromatic plate No. 27 and the window exposure was a trifle too long.



CHILD STUDY. By FRED. BOISSONAS.

AN ATTEMPT TO PHOTOGRAPH A SPECIMEN OF A BRITTLE STAR.

BY R. L. MADDOX, M.D., HON. FELL. R.M.S., ETC.



By T. TROWBRIDGE.

TOWARDS the close of the sixties, having found in the Solent numerous specimens of the small brittle star (ophicoma neglecta), they were washed carefully in distilled water, and then covered by a considerable quantity of rectified spirits and set in sunlight to bleach. Many were afterwards removed and allowed to dry on a clean bit of glass, being placed with the oral aperture uppermost, and carefully protected from dust, it being most difficult to remove any adherent particles that might happen to fall on them, especially when damp. A selection was then made of the most perfect of both the small and medium size, and some of these were mounted dry, as transparent and opaque objects. Each was protected by a flat tin ring-cell. Those to be viewed as translucent objects were simply placed, oral parts uppermost, on a speck of gum water in the centre of the ordinary 3 x 1 inch slide, and those to be examined as opaque objects were similarly fixed to the centre of a circle of dead black paper fastened to the slide at the bottom of the cell, and each left uncovered. From their most delicate structure and exquisite crystalline appearance, due to minute shining facets or scales of carbonate or phosphate of lime in the outer texture or skeleton, it was judged that they would form beautiful objects for photo-micrography. Numerous trials were made with different objectives and under varied methods of illumination, both singly and stereoscopically, but only to meet with disappointment, as the finished prints gave a sadly poor idea of the beauty of the object as seen under the microscope.

Casting about for a subject for an article to meet the request of the Editor of THE AMERICAN ANNUAL OF PHOTOGRAPHY, it occurred to me, that it might be worth while to make another effort under somewhat different methods, using gelatino bromide plates, and forward the result as my contribution. The following is a description, in brief, of the plan adopted, and I regret to say, the prints still show a sad deficiency under trials more numerous than I care to mention.

In the first place a supplementary stage for the slides was made from a piece of rolled flat brass plate, 3½ inches by 2 inches, an aperture five-eighths of an inch being made in the centre; the long edges of the brass were then turned up sharply at right-angles, to the extent or depths of three-eighths of an inch. At each end for the distance of 1 inch, these upturned edges were filed down somewhat so as to lessen weight. A quarter of an inch ring was cut from a 1 inch stout brass tube, one surface being made true, the other or under surface was cut away by a file, so as to furnish a double wedge as in Fig. 1. Two ears were then soldered above the angles, one on each side, a deep notch having previously been made in the flat surface of the ring at points opposite to each other, and exactly over the point of the wedge. The ears were now turned down outwardly over the turned up edges of the supplementary slide, so as to clasp them. The ring was then set down on its wedge-shaped points, exactly over the central aperture, and two small holes were drilled through the ears and upper part of the turned up edges of the brass plate, exactly facing the two notches in the upper surface of the ring. Two small pins were then passed from the inside through the notches and through the apertures in the ears and upright edges, so that the ring had now a free up and down movement of about 7 deg., thus allowing to the glass slide when placed on the flat surface of the ring, a displacement to that extent.



FIG. 1.—SIDE VIEW.

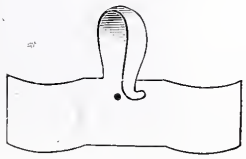


FIG. 2.

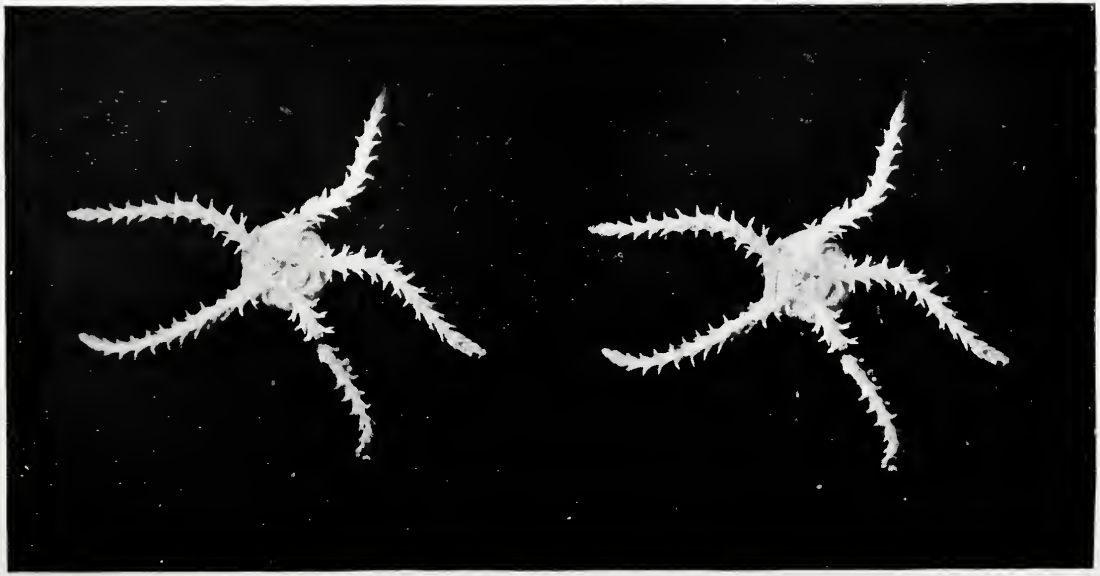


FIG. 3. A STEREOSCOPE VIEW OF ENTIRE BRITTLE STAR; THE SIZE FROM TIP TO TIP OF RAYS THIRTY-THREE ONE-HUNDREDTHS OF AN INCH ; TAKEN IN BRIGHT DAYLIGHT WITH PLAIN MIRROR AT SIDE.

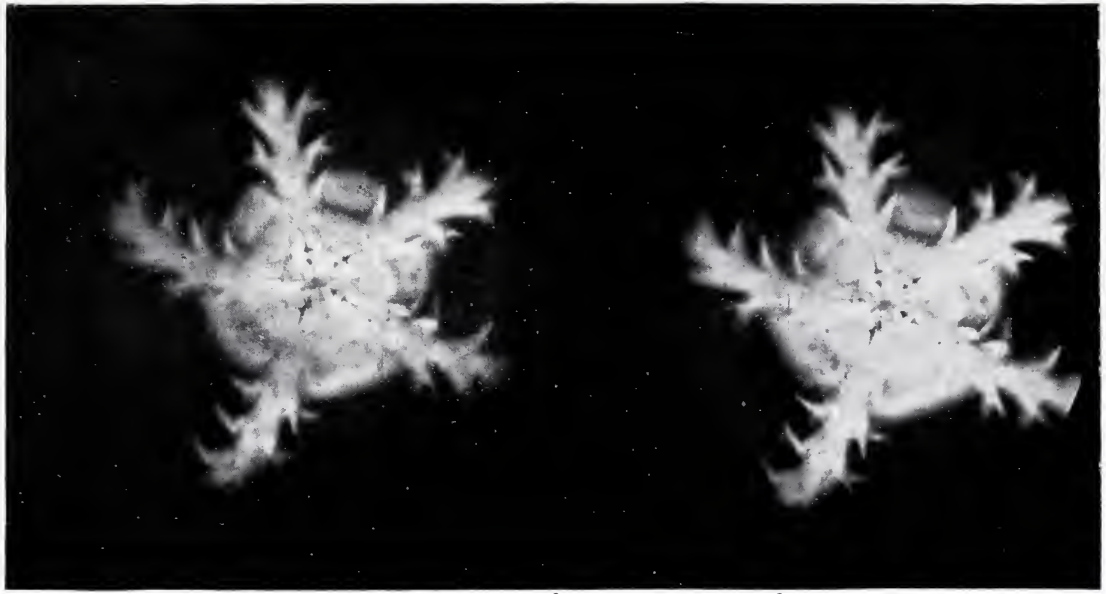


FIG. 4. A STEREOSCOPE VIEW OF ONLY THE BODY,—FOUR ONE-HUNDREDTHS OF AN INCH IN SIZE,—OF A SMALL SPECIMEN TAKEN IN DAYLIGHT WITH FLAT MIRROR AND PARABOLIC CONDENSER.



Fig. 5. A single view of same object and same arrangement except that the object remained parallel to the front of the objective and illuminated by very bright daylight.

To keep the slide fixed at that angle, or any lesser one, two strips of thin springy brass, rather wider than the turned up edges of the brass plate, were bent in such a manner, after having holes drilled in them for the pns to pass through, that when placed between the outside of the ring and the inside of the turned-up edges of the brass plate, they, by the bent portions, acted as springs. These thin strips were cut in such a way as to permit of a narrow flap being turned down on to the glass slide, so that they kept the slide in position when the microscope was placed in the horizontal position; Fig. 2 will illustrate the same. M. Moitessier was, I believe, the first to use a stage with angular motion in taking stereo-photomicrographs of minute objects, but his plan differed from the above simple arrangement. This extra stage when used with slides as opaque objects has the central aperture overlaid by dead black paper, and when using light simply reflected from a flat mirror placed at the side of the objective.



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"THE GLEANER."
By A. MORENO.

This supplementary stage with the slide was now placed on the stage of the microscope, and a 3-inch objective being selected, a small camera was attached to the ocular end of the body of the microscope and drawn out so that the object (the rays of the brittle star) would about fill the space of 2½ inches in a black card stop placed before the sensitized plate. A strip of black velvet was now rolled round the brass tube of the objective and then fastened. The lower or front part of this velvet tube was then cut sharply away at one side for the width of half an inch, and about six-eighths in height, forming an open space for the admission of light to the object, the opposite side or edge of this soft tube being brought down on the slide, to shut out extraneous light. A plain mirror with ball and socket joint was then fixed to the ordinary condenser rod and stand so as to slide up or down. Everything being ready, the microscope with camera placed on a baseboard and in alignment, was set on a firm table, near a window facing the open sky. The mirror was placed first to the right of the objective, the velvet tube turned round so that its open space or window would admit the rays from the plain mirror to the object. The object was now centred and focused on the ground-glass of the camera. The slide, with sensitized plate was introduced, the light to mirrors shut off, the shutter lifted, a slight interval awaited in case of vibration, the screen removed and exposure made, in this case varying from 2 minutes to 2 minutes and 20 seconds. Before the final focus was made, the glass slide was depressed through its 7 deg. on the right hand. This furnished the right hand negative. The mirror was now changed to the left side, velvet tube turned round on the objective, and the glass slide depressed its 7 deg. on the left side, the object re-examined to see that all was correct, and then the left negative was taken. The prints from these are to be afterwards reversed in mounting if to be viewed stereoscopically.

After taking some negatives, and getting the about right exposure, it was found that one of the rays of the brittle star was not in the same plane as the others; it was most gently pressed down and the slide replaced on the stage. To my great consternation on examining the image it was found

the ray had snapped, thus fully justifying its name, and had fallen on the rack bar of the substage condenser. How to remove and replace it in position was a most serious consideration. I did not dare to use forceps, a fine camel hair brush was, if employed, almost sure to cause the tiny fragment to adhere to it by its minute spines; at a risk the tip of a sparrow's feather was tried as a miniature spade, to lift the fragment, and after getting it on to the tip of the feather it was turned over on to the surface of the dead black paper on the bottom of the cell. By patience and gentle coaxing, after placing a speck of saliva on the spot it should occupy, it was gradually worked into position, and though somewhat damaged it fortunately remained attached for the remainder of the trials. Having finished with this specimen, another slide with a smaller one, mounted simply on the glass slide as a translucent object, was placed on the stage, a two-thirds objective being selected; the object was now illuminated by the flat mirror of the microscope and the parabolic condenser, the slide being again depressed in opposite directions for the two negatives. Bright daylight was employed after rejecting strong or full sunlight. The results, such as they are, accompany this article and are placed at the editor's disposal. It now remained to try the lieberkuhn and dark well, illuminating the object by rays from the flat mirror, still using the supplementary stage; but all efforts were fruitless to obtain satisfactory negatives under the use of the same two-thirds objective; the difficulty appeared to be in getting the best general focus. It would lengthen this article too much to detail all the "up and downs" of error in exposure, slight faulty illumination by which the fibres of the black paper became too evident, and by over or under development; suffice, it was just a case of patience under "error and trial;" but it is often an advantage to record our failures for the benefit of others in the hope they may succeed where we have failed.

PHOTOGRAPHY AS AN AID TO MINERS.

BY NEWTON W. EMMENS.



FIG. 1.

MINING engineers, superintendents and mine owners are now beginning to appreciate the utility of photography as an aid to developing and reporting upon mining properties. From a geological point of view also, photography is beginning to play an important part. There are many interesting things met with in mining which, without the aid of photography, would be found very hard to describe in such a manner that a lay person could understand them fully. A good case in point happened in a mine with which I was connected near Amador City, on the famous Mother Lode of California. A level had been driven to a depth of two hundred feet from surface with the hope of cutting the continuation of a vein which was being worked some seventy-five feet above. The level had been driven about forty feet, and the only ore encountered consisted of stringers of quartz, which appeared rather more solid in the roof than in the floor of the level. Accordingly it was determined to carry a stope (another level) over the level already driven, and to commence it at the point where the stringers first made their appearance. The stope had only been driven about fifteen feet when the vein was encountered, and then the

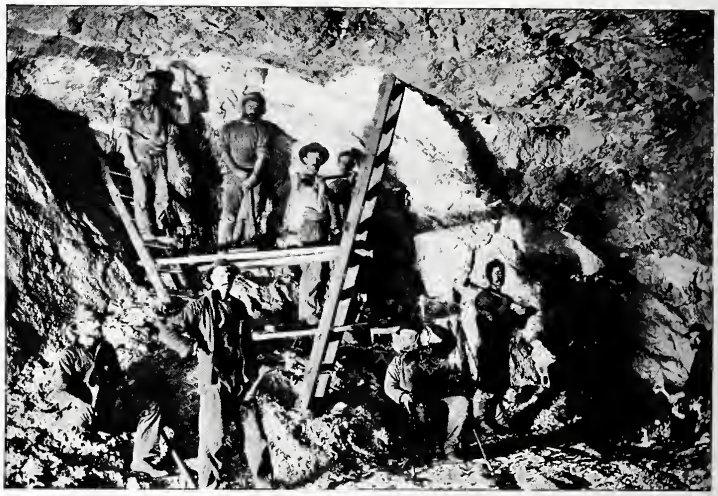


FIG. 2.

reason why it had not been met with in the level below was self-evident (*vide* Fig. 1).

From a geological standpoint this photograph is most interesting, as a study of it shows that the vein must have been bent in this curious manner *after it had been deposited.*

In a mine near that above referred to there had been opened up a fine vein of ore at the ten hundred level (*i.e.*, 1,000 feet below the surface), and a large piece of ore had been taken out for exhibition at the "Mid-winter Fair" in San Francisco, Cal., by the company operating the mine. The suggestion was made that I should go over to the mine with my camera and take a photograph of the place from which the ore was extracted, and that an enlargement of the picture should be then made and placed on exhibition with the ore, so that the general public could see at a glance what kind of a place the ore was taken from and how large the vein was. The photograph (*vide* Fig. 2) came out very well and shows quite plainly the banded structure of the vein, which, on the Mother Lode of California, is considered a sign of richness, and is called "ribbon rock." Some portions of this vein yielded as high as $60 in gold to the ton.

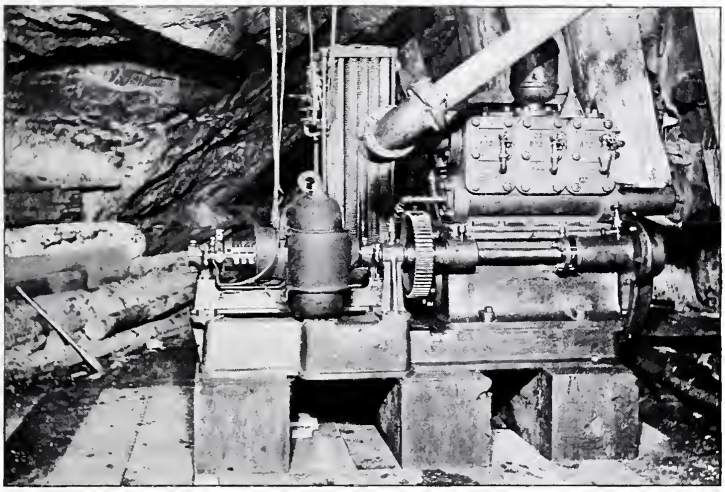


FIG. 3.

On the five hundred foot level (*i. e.*, 500 feet below surface) of the same mine an electric pumping plant had been established, and as it was the first of the kind to be used in the district a photograph of the plant in place was thought desirable, so that other miners when told of the matter could understand, by looking at the photograph, exactly how the pump was arranged without having to make a trip to the mine and go underground (*vide* Fig. 3).

In making reports to stockholders of mining companies photography will be found of great use, as there are few people (outside of mining men) who understand mining terms. A case in point is a report on some mines, with which I was connected, in which mention is made of "the Hanging-wall Vein," and in illustration of which a photograph was taken (Fig. 4). Without this illustration there are probably very few of the stockholders who would understand what was meant by the term, but an inspection of the picture makes the meaning perfectly clear.

Nos. 2, 3 and 4 of the above-mentioned photographs were taken on 5 x 7 Seed 26X plates with a Bausch & Lomb 5 x 8 Universal Lens, using stop *f*/8 and developed with Eiko. cum Hydro. developer, Carbutt's formula. No. 1 was taken

on a Seed 27 plate and the stop used was $f/16$, the remaining details of its treatment being the same as in the other cases. The light used in all the photographs was produced by two "Standard Flash Lamps" with a reflector behind each. Fifteen grains of pure powdered magnesium were used in each lamp, and the two charges were fired simultaneously. The lamps were connected together by two pieces of rubber tubing (each being five feet in length) joined by a small brass tee to the free end of which a third piece of rubber tubing, six feet long and terminating in a rubber bulb, was attached. By this arrangement I was enabled to reduce the intensity of the shadows by placing the lamps some distance apart, and so got a more even illumination than could be obtained by having the light produced from one point.



FIG. 4.

The quantity of magnesium used will be found to vary according to the light-absorbing power of the surrounding rocks. Take, for example, Figs. 1 and 2. The quantity of magnesium used was the same in both cases, but the light-absorbing powers of the two places were vastly different. In the case of Fig. 1 the rock was composed chiefly of white quartz with a few streaks of black slate running through it, and the size of the level was about 15 feet high and 20 feet wide. Here the camera was placed about 20 feet back from the face of the vein; but as nearly all of the light was reflected by the quartz a good negative was obtained. In the case of Fig. 2, the rock was largely black slate, and the size of the level was 6 feet high by 5 feet wide, the camera

being placed only about 5 feet back from the face; but as the bulk of the light was absorbed by the black slate there was no over-illumination.

The chief troubles in underground photography are twofold. First, there is always more or less water dripping from the roof of the levels and chambers. Care must, therefore, be taken to provide a piece of rubber cloth and keep the camera well covered up. Secondly, there is considerable fogging of the lens caused by condensation of moisture on the glass. This arises from the difference of temperature between the air in the mine (which is usually quite moist) and the lens. The only way of overcoming it that I have hit upon is to set up the camera at the place where the photograph is to be taken and then, after uncapping the lens, to carefully wipe off the moisture with a clean piece of rag, and continue doing this until the lens remains perfectly clear. Just before drawing the slide and making the exposure it is a good plan to take another look at the lens and make sure it is quite free from fog.

In taking photographs in coal mines great care should be taken to see that the air is quite free from gas; as, otherwise, the photographer might get more than he bargained for, and might cause an explosion by igniting the gas with the flame from his flash-lamp. Another thing to remember is that coal mines require more magnesium than in metal mines, owing to the great light-absorbing power of the coal.



WATER RATS. By H. G. READING.

ACCESSORIES.

BY ED. BIERSTADT.



AT SCHEVENINGEN. By C. L. BAER.

SURELY it is time that a change was made in photographic accessories?

We ought to have the surroundings in our portrait galleries more natural than those we now have.

Why not have your skylight room fitted up like a parlor, sitting-room or library, with real objects instead of imitations, backgrounds painted or papered like the walls of your living-rooms, and for out-of-door picture effects have them painted in the natural colors.

Experimenters are struggling hard to make portraits in natural colors from the living persons; in fact, it is now possible to make the three necessary negatives required within three minutes, but the sombre, funereal color of the furniture, backgrounds, etc., is not what would be desired in the picture, to say nothing about the gloom that usually hangs about such a place, which even a brilliant skylight will not dissipate. How often we hear people comparing the sitting for a picture to having a tooth pulled, and some even say they would rather have a tooth pulled than to sit for a portrait; one-half of this is due to the gloomy surroundings.

Cheerful colors go far towards inducing cheerful expressions.

Since the introduction of orthochromatic photography there should be no trouble in getting good color values when objects are in their proper natural colors; there is no necessity for monochrome accessories; the brilliant colors of

nature are more pleasing to the eye, more in harmony with dress and complexion, will produce a more satisfactory feeling in the sitter, and naturally make a better picture; and, lastly, it will enable experiments in color photography to be made with some show of success.

ASTRONOMICAL PHOTOGRAPHY WITH PHOTO-MICROGRAPHIC APPARATUS.*

BY DR. A. CLIFFORD MERCER.



PORTRAIT. By A. MORENO.

DURING a few hours of the twentieth of October, 1892, occurred a partial eclipse of the sun which would have been visible in Syracuse, N. Y., had not clouds interfered. Early in the day, notwithstanding the overcast sky, I placed my heliostat on a shelf outside a south window, (Fig. 5, page 74, ANNUAL 1896). Within the room I arranged a portrait lens of eight inches focus and a microscope in the same axial line, as seen in Fig. 4, p. 73, ANNUAL 1896. The substage condenser was removed and a camera connected with the eye end of the microscope tube. Such sunlight as fell on the mirror of the heliostat was reflected through the portrait lens. The portrait lens projected an image of the clouded sun's disc, about one-twelfth of an inch in diameter, in the plane usually occupied by an object on the stage of the microscope. This tiny image

*Read before the American Microscopical Society August 19th 1896. Published in advance by special permission of the author.

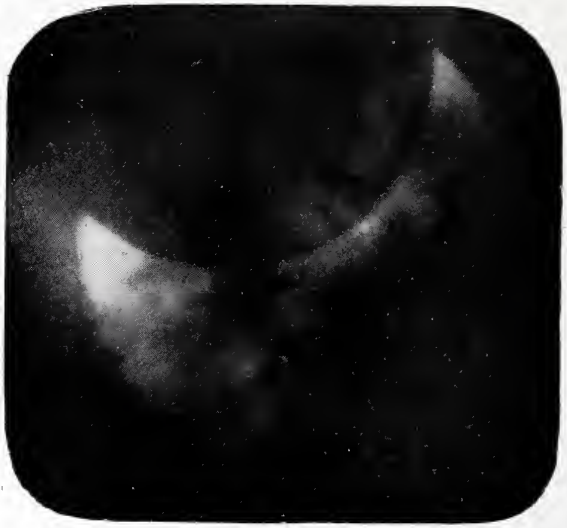


FIG. I.



FIG. II.

was itself projected by a microscope objective of an inch and a half focus to form a second image, two inches and three-eighths in diameter, on the ground-glass of the camera. The clouds made sharp focusing impossible. Only an imperfect focus was obtained. The clock of the heliostat kept the image steadily on the ground-glass.

During the eclipse sensitized plates were substituted for the ground-glass. Exposures were made when the clouds were thin enough to permit. Thus six negatives were secured. Prints from two of these are submitted with this paper (page 156). In looking at these prints one is to imagine he looks to the south with east to his left, west to his right, north overhead and south toward the horizon. In the prints the relative positions of the discs of the moon and sun are reversed from right to left, from west to east. So the first print shows the moon's black disc advancing apparently from the north-east across the sun's disc, while the second shows the moon's disc passing off to the west.

This is, I believe, the first record of an attempt to use photo-micrography astronomically. All the necessary apparatus could be easily packed in a trunk, possibly in a hand-box. Such apparatus is portable and well adapted for transportation. If an unaided telescope objective were used to project an image of the size obtained in our negatives, a focus of twenty-one feet would be required; and the lens would have a diameter of about sixteen inches, if made as such lenses are usually. Such an objective properly mounted would result in an instrument nearly half as large as the great Lick telescope, with its photographic objective. In other words by using a portrait lens having a focus of fifteen or sixteen inches, a size commonly used for "cabinets" in photographers' studios, instead of the portrait lens I used, the apparatus I have described would produce a negative image equal in size to that produced by the unaided Lick lens; or, leaving my portrait lens in place, the same result could be obtained by substituting for the microscope objective of one inch and half focus another of about double the power, one of three-quarters of an inch focus. The Lick instrument has a tube about fifty feet long and forty-two inches in

diameter, while my apparatus has two tubes each less than one foot long and with diameters varying between one inch and six inches. To the smaller tube is attached a camera with a bellows extending from one to six feet. Stability and freedom from vibration are comparatively very easily obtained with the small and short apparatus. The difference in housing rooms is very great. The difference in cost is enormous. It is evident that in several respects the photo-micrographic arrangement has advantages over the great Lick photographic objective.

If, however, we turn to the matters of light and separating power, the very great superiority of the Lick objective is seen. The results given in the following tabular comparison are only approximately accurate, and I have not taken into account the loss light suffers by absorption as it passes through glass, and by reflection at incident surfaces, the Lick objective consisting of three thick lenses and the photo-micrographie arrangement having more than twice as many, but comparatively very thin, lenses and the mirror's reflecting surface:

	Lick objective.	Larger portrait lens	Smaller portrait lens.
Diameter of objective	33 in.	3.75 in.	2 in.
Focus of objective	550 in.	15 in.	8 in.
Focus divided by diameter	16.66	4	4
Relative value of light in first images.	1	16	16
Size of first images	5.1 in.	.1395 in.	.0744 in.
Total equivalent focus, 550 inches, divided by diameter	16.66+	147	275
Relative value of light in final image	1	$\frac{1}{77}$	$\frac{1}{277}$
Time of exposure, eclipse of sun (about)	$\frac{1}{1600}$ sec.	$\frac{1}{20}$ sec.	$\frac{1}{8}$ sec.
Separating power	1	$\frac{1}{8.8}$	$\frac{1}{16.66}$

The tabular comparison needs no explanation, I think, excepting, perhaps, the meaning of "separating power." Other things being equal, separating power varies with the aperture, or diameter, of the objective. If the Lick objective, having an aperture of thirty-three inches, could barely show a certain double star as two distinct stars, it would be impossible for any objective having an aperture of four or two inches to show such a double star as two distinct stars. A star

apparently single when seen through any objective having an aperture of two inches might be seen to consist of sixteen or seventeen stars in line almost touching one another when seen through the Lick photographic objective. A star apparently single when seen through any objective having an aperture of three inches and three-quarters might be seen to consist of eight or nine stars in line almost touching one another when seen through the Lick photographic objective. This power of resolving an apparent single star into two or more, or of resolving into details sun spots or other objects, is known as separating power. Notwithstanding the tabular showing, the photomicrographic arrangement has advantages in some respects as already mentioned; and to these should be added, I imagine, the superior correction of aberrations now possible in lenses made of small discs of glass which are produced in great variety as to optical properties, a variety not yet realized, I suppose, in large discs.



"A DRAWER OF WATER." By JESSE POUNDSTONE.



Taken with a Prosch Mf'g Co's "Athlete Shutter."

Copyright, 1896. By J. BURTON.

THE START.

BY JAMES BURTON.

PHOTOGRAPHY AND FORGERY.

BY D. T. AMES.



"THE CHASE FOR THE BUTTERFLY."
By CHAS. E. FAIRMAN.

BUT few will deny that photography has made rapid strides of late, and its use is gradually becoming better known by those interested in the arts and sciences. Having received from the editor of THE ANNUAL a request for a contribution from my pen upon the uses of photography in connection with the illustration of forged and spurious handwriting, I take pleasure in offering the following:

I have made use of my own autograph as the subject, having been naturally written and placed in the hands of Mr. Chas. F. Johnson, of *The Journal* staff of artists, one of the most skilled pen artists in America, to be copied, which he has admirably done through the means of a tracing. His copy, with the original, accompanies this communication. It will very nicely illustrate one of the phases in which photography is used to great advantage in the illustration of forgery. In order that it may be fairly understood by your readers, I present herewith an analysis of the writing, as I would present it before a jury, in demonstration of the forgery. The photograph is used to multiply copies, so that each one, of the jurors may hold a copy in their hands while I present the analysis showing the evidences of forgery. This I do, making use of a blackboard and crayon,

calling attention to the speeific distinetions whieh usually exist between the genuine and forged signatures. In this, as in all other cases of forgery by traeings, the spurious signature will be found to possess almost the exaet outlines of the genuine, so exact that that faet is in itself an evidenee of forgery, as no two genuine signatures are likely to present a similarly exaet measurement as to length and details of the writing.

I have indieated the numerous differences between the copied and genuine signature by numerals.



No; 1 refers to the staff of the "D." By comparison it will be observed that the shade in the copy is not as low down upon the staff and therefore presents a different characteristic than does the genuine. No. 2 represents a hesitating and irregular quality of line, whieh being drawn is thicker and less graceful than in the genuine. No. 3 indieates the shade upon the capital "D." It will be seen that in the genuine the shade is a perfectly uniform increase to the centre and then an equally uniform diminishing shade until it reaches a hair line, while in the copied signature it lacks this uniformity of increase and diminish of shade.



"A VIENNESE BEAUTY."
By ADELE.

No. 4 indicates a misplaced shade in the copied signature. No. 5 indicates a hesitancy in the hairline and an enlargement, which under the microscope becomes very visible and is a certain evidence of being a copied line. No. 6 indicates a mistake of the copyist in placing a loop in the top of a staff where it is a hairline in the genuine. No. 7 indicates the transposition of the shade in the staff of the "T." No. 8 indicates a difference in the shape and curve of the initial to the cap of the "T." No. 9 indicates again the quality of a traced line rather than a habitual and struct line. No. 10 indicates a transposition in the shade of the capital "A." No. 11 indicates a pecular hesitancy in the formation of the loop in the staff of the "A," as against the genuine, which is the result of the copying effort. No. 12 indicates the shaded line in the small "m" which applies to all the strokes of the "m" as against the "m" in the genuine. No. 13 indicates a wave and hesitancy, and change of slant in the last member of the small "m." No. 14 indicates a broken-backed "e" and misplace of the shade. No. 15 indicates a change in the curve and character of the small "s" as distinguished from the genuine. No. 16 represents the ragged misplaced shade in the rubric below the signature. No. 17 indicates the character of the drawn hairline in its shade and irregularity as against that of the genuine. Under a microscope all of these points that I have mentioned and many others, including the retouching of the shaded lines, become very manifest and are emphasized by means of an enlarged photograph. Signatures are often enlarged upon photographs by the solar process, to a length of 3 or 4 feet, so that they practically present to the eye of the jury what the expert observes through a microscopic examination or the signatures. Thus photography greatly aids in the demonstration of forgery. As the signatures here presented are enlarged, many of the points that I have mentioned appear more conspicuous than in the original copy. Were it possible to present them enlarged to three or four feet the discrepancies which I have mentioned would become very conspicuous. It is for the purpose of presenting it in this manner to the jury that photography is used.

Where forged and disguised writings come in question before courts it is customary to have them photographed at nearly the same size, in order that copies may be held by each of of the jurors as the expert gives his analysis and explanation of the evidences, which greatly aids in the proof or disproof of the genuineness of questioned writing.

THE CAMERA IN TRAVEL.

BY R. HITCHCOCK.



"THERE THEY ARE!"
By MARIO DEI FIORI.

PHOTOGRAPHERS have found their way into nearly every part of the world, and many photographs of great interest and scientific value are to be found in private collections. I am often impressed with the thought, however, that very much talent and labor are wasted and many opportunities lost, merely because the traveler and photographer in remote parts of the world and among people but little known, is not better equipped for the kind of work which he might do without sacrificing his pleasure or artistic desires. Thousands of photographs are taken abroad which really do not show anything characteristic of country or people. They are of interest only to the individual and his friends, as a record of the journey. They may be fine pictures, but they could be almost duplicated at home.

It is not to be supposed that the average traveler for pleasure will be an ethnologist, but a short course of reading in some good work upon mankind and ethnic relations would certainly prove of great assistance to those who have opportunities for travel. The average individual, however

well informed he may be upon general topics, is by no means a good observer. Writers of the most interesting books of travel—I refer particularly to those books which are most popular among the great mass of readers—are not usually the most truthful in their portrayal of the scenes and experiences in foreign lands. The desire to write an entertaining narrative is paramount and they too often exaggerate the most commonplace experiences to fill their pages for the entertainment of the public. They make very comical situations out of little trifles of conversation, carried on through the medium of a native interpreter or guide, who is frequently unconsciously responsible for all the humor there may be in them. The fact is, that most of the absurd situations described by travelers are of their own making, largely due to their own mistakes and misunderstandings; for the barbarian and the savage is no fool in the ordinary affairs of life, and the differences in their manner of reasoning and the deductions these bring about are not one whit more absurd or illogical than many which prevail among our own people in this late day and generation.

But in consequence of this looseness in observation and disregard of truth on the part of many writers, very erroneous notions prevail concerning strange lands and peoples; whether the much loved and admired Japanese, the detested Chinese, the warrior Zulu or the picturesque American Indian. Concerning all of these, it is perfectly safe to say, that the popular notions are wrong, very far indeed from the truth; and what is worse, when one does attempt to conscientiously tell the bare truth, the chances are that he will not be well received—it is not safe to combat established opinions, especially when they are cherished as matters of faith.

Doubtless the time will come when the public will be more critical, when the fact will be generally recognized, that one must have more than mere literary talent to enable him to write an acceptable book of travel.

The use of the camera teaches habits of observation. The untrained eye does not take cognizance of the details of a scene; only of the conspicuous features. The photographer



AN IRISH FISH MARKET. By E. ATKINSON.



A WAY SIDE INN. Switzerland. By ERNST LAMBERT.



THE APPROACH OF NIGHT. By E. ATKINSON.

soon learns the importance of the subordinate features in the picture; hence the faculties of observation are quickened. This alone gives value to the camera as an aid to the traveler. In a strange land there are innumerable happenings on every side, which the ordinary tourist does not see, or at least he deems them too insignificant to attract notice; yet it is these very trifles which make up the daily life of the people and add immensely to the interest of its study. Herein comes the great utility of the hand-camera. One who uses this inconspicuous device learns to study people on the streets, at their avocations, their costumes, attitudes, etc., and the portrayal of these adds immensely to the interest of the story.

The unquestionable truthfulness of the camera is of prime importance for such observations. I have not so great confidence in the artist with pen and brush. The "artistic sense," which, by the way, is something very remarkable, uncertain, and subject to change with the dictates of fashion and critics, too often controls, and modifies. There may result a much more beautiful picture than the camera can make of the subject, but it may not be true. The realities form only a motive for such work and the imagination perfects it. The camera is more restricted in its range, but one may pin his faith upon its honesty.

These observations are inspired by experience. When I first visited the Orient I carried a photographic outfit, determined to bring back a record of my travels and to settle certain points in controversy between writers by its aid, and the results have been gratifying, although at the expense of considerable labor.

On the Island of Yezo, in the far north of Japan, there lives a remnant of a race of people popularly known as the "Hairy Ainos." Concerning these people there is considerable scattered literature, but it was still an open question, whether hairiness of the body was a characteristic of them or not. While some authors contended that they were not a hairy people, others depicted them uncouth as shaggy dogs, thus illustrating the utter incompetence of common observation to establish the facts in such an apparently simple ques-



LES BOCARTS.

BY CH. BERTEAUX.

tion. I traveled a thousand miles among the Ainos, visiting the most remote settlements where the purest types were found, and my photographs, reproduced in a Smithsonian Institution Report, not only show that hairiness is a conspicuous characteristic of the men, but they further demonstrate that the excessive growth of long, black hair depicted by certain artists—latterly by a young artist of some fame, who has likewise written a book upon his travels there, somewhat later than my own—is not representative of the people as a whole; and while there may be a living example such as is represented by the hand of this writer, it can only indicate a reversion to an ancestral type—possibly the picture is true to life, but I am disposed to grave doubts.

Still later an elaborate monograph has been published, by an eminent ethnologist, who, however, had not seen the Ainos, based very largely upon Japanese pictures of the people and written descriptions from various sources. Unfortunately, all the Japanese representations of the Ainos are either conventional or absurd caricatures, utterly useless as a basis for ethnological study, and the conclusions of the author are therefore of very questionable value. Certainly they are not borne out by my photographs.

In other directions the camera has also served me well. My series of photographs of the ancient burial mounds of Japan is extremely valuable, particularly since many of those monuments of a past civilization are being destroyed and effaced. In some cases the tombs of prehistoric or mythical emperors are being altered and beautified by the government, in a manner to change their primitive character and surroundings.

Not to multiply examples, enough has been said to indicate the value of the camera to the traveler, and especially to the resident in a foreign land. Its evidence is indisputable, it is independent of the personal equation, it confirms as well as illustrates the written statements.

THE OLD GARDNER HOUSE.

BY ADELAIDE SKEEL.



THE OLD GARDNER HOUSE.
By ADELAIDE SKEEL.

AMONG better known historic sites at Newburgh, N. Y., a town noted as having been Washington's headquarters at the close of the Revolution, one pauses before the old Gardner house to wonder what happened here. The pilgrim has been shown the Hasbrouck house, where Washington lived with his family and staff, the Ellison house, the residence of Knox and Greene, Forge Hill, where the links of the chain which was thrown across the Hudson were made, the home of Lafayette at New Windsor, the last cantonment of the American army on Snake Hill, and the supposed location of the Temple where the famous address was delivered in which our great Commander-in-Chief put away ambition by refusing the offered Dictatorship, but the local guide rarely points out this once well remembered home of Silas Gardner, the Tory who here made his house the headquarters of an underground railway or secret passage to Canada.

If one question the motorman on the trolley which passes the place a dozen times a day, the only response will be: "*Dunno*, looks old, likely 'tis, but there's a boom in real estate since we run the road by, and I guess things will be fixed up first rate by another year." Then, the fares must be taken, and the seeker for local history or poetic legend is left to his own imagination for fact or fancy.

The facts are few but not devoid of interest. The Gardner family came up from Long Island, and ultimately Silas Gardner became the owner of about six hundred acres in the neighborhood of Newburgh, where a small settlement, to-day, bears his name. Cadwalder Colden, Jr., was the patron of Silas, and as the former was a rich and noted Tory, it is not

astonishing to learn that the poor Long Island farmer became shortly a person of considerable consequence in Redcoat circles. He once helped Lady Sir John Johnson through the lines to the enemy, and received in pay a gold ring from the lady's taper finger. For this offense, however, he was caught as a spy by the Provincials and sentenced to death, but, eventually, pardoned by Governor Clinton under the gallows at West Point, and permitted to return to his home. To-day, his old house is silent, its wicked past forgotten, and trolley passengers rarely turn their eyes to look at its grey walls.

"A house stands far,
On the lonely moor,
Empty and desolate,
Ruined and poor.

"The hands which builded it,
Long are dead,
The souls it sheltered
From earth are fled.

"False or faithful,
Coward or brave,
They all are asleep,
In the hush of the grave."



"A PICTURESQUE COTTAGE." By GEORGINA WILLS.

DR. JOHN JOLY, F. R. S. AND HIS WORK.

BY STEPHEN H. HORGAN.



"BRINGING HOME THE WOUNDED LAMB."
By KATE MATHEWS.

TO THE list of scientists who devote a portion of their time to photographic research a new name has been added, and this is : John Joly, M.A., B. E., Sc.D., F. R. S. To him is credited a solution of the complex problem of photography in colors. For the purpose of gratifying a natural curiosity as to his personality I asked Dr. Joly for permission to publish his portrait in THE ANNUAL, but certain conventional proprieties unfortunately interfered with his granting this request. He showed me some of the bewilderingly beautiful transparencies he has obtained by photographing through lines of three colors. One of these transparencies, a reproduction of the Solar Spectrum was so satisfactory that it would seem as if it were unnecessary to seek further for a method of color-photography. It is impossible to describe here Dr. Joly's precise method of obtaining his results, owing to the question of his rights to the protection of a patent being, at this writing, pending.

Dr. Joly promises to possess a brilliant future, being but



TOIL AND LEISURE. BY ALFRED WERNER.

39 years old and full of restless energy. In appearance he is thin and tall. A dark drooping mustache and eyeglasses mark him as a student. He was born in Hollywood, Kings Co., Ireland, and was partially educated at the Rathmines School, in Dublin. He entered Trinity College in 1876; received the degree of Bachelor of Engineering in 1883, and that of M.A., in 1887. After years of experimental study of the subject, he wrote a paper with the title, "On the Direct Experimental Determination of Specific Heats of Gases of Constant Volume." This won for him a fellowship in the Royal Society. In the philosophical transactions of the Royal Dublin Society are recorded many of his papers with such titles as: "On a Diffusion Photo-meter"; "A Speculation as to a Pre-material Condition of the Universe"; this and his paper, "On the Abundance of Life," place him as a charming writer who can render most interesting scientific studies. His ingenuity is shown in his "Shutters for Use in Stellar Photography." He is a member of the Council of the Royal Dublin Society and at the present time Assistant Professor of Experimental Physics at Trinity College, Dublin, besides being Professor of Physics in Alexandra College of the same city.

Being called upon to deliver before Trinity College a lecture on Mr. Fred. E. Ives' method of color photography, Dr. Joly began to experiment on the subject. On May 28, 1895, he made public for the first time his discoveries in this direction. This was before the Dublin University Experimental Association, and the paper was entitled, "On a Method of Photography in Natural Colors." Later he appeared before the Royal Society of London, on the same subject, and his name and fame have since gone around the civilized globe.

In this paper the principles of his method are given. The ordinary camera and isochromatic plates are used, the difference being that a sheet of glass or transparent celluloid ruled with lines numbering 200 or 300 lines to the inch, adjacent to each other, and colored orange, yellow-green and blue-violet alternately, is placed in front of, and in contact with the isochromatic plate during exposure. A glass posi-

tive is made from a negative produced with this lined screen. A second screen, ruled at exactly the same degree of fineness as the first, or "taking" screen, but with lines of color, in red, green and blue-violet, is applied to the positive, and when in proper register, the picture flashes out with all the colors of the original apparently increased in brilliancy. These results, Dr. Joly says, are attained by no new photographic operations. It is necessary to use good orthochromatic plates sensitized into the red, and also to have affixed in the lens an orthochromatic screen cutting off the ultra-violet light in the usual manner.

In the course of these investigations Dr. Joly found, with Abney, that Maxwell's curves are not color sensation curves, nor on the other hand does he accept entirely Arthur von Koenig's curves of color vision, so that a new chart of color sensations is likely to result, bearing Dr. Joly's name. In fact every line that flows from his pen on the subject of color or color-photography cannot but be of interest, for he has placed himself in the front rank on this subject.



CHILD STUDY. By FRED BOISSONAS.

ON THE STANDARDS OF THE PHOTOGRAPHIC SOCIETY OF LONDON.

BY WM. HARKNESS.

THE standards adopted by the Photographic Society in 1881 relate to lens diaphragms, lens mountings and fittings, and camera screws.

In connection with lens diaphragms, the uniform system numbers and the method of computing exposures from them are a most important matter; but the explanations of it usually given in the photographic year-books are scarcely satisfactory, either in brevity or in clearness. Possibly something may be gained by presenting the subject in the form of a series of rules for the solutions of definite problems.

PROBLEM I.—To find the uniform system number from the diaphragm ratio, expressed in the usual form, f/n. *Rule.*—Divide n by 4, and square the quotient.

Example 1.—Let the diaphragm ratio be $f/16$. Then 16 divided by 4 gives 4, and that multiplied by itself gives 16; which is the uniform system number.

Example 2.—Let the diaphragm ratio be $f/30$. Then 30 divided by 4 gives 7.5, and that multiplied by itself gives 56.25; which is the uniform system number.

PROBLEM II.—To find the uniform system number from the equivalent focal distance of the lens and the diameter of the diaphragm. *Rule.*—Divide the focal distance by four times the diameter of the diaphragm, and square the quotient.

Example 1.—Let the focal distance be 12.44 inches, and the aperture of the diaphragm 1.31 inches. Then 12.44 divided by 4 times 1.31 gives 2.37, and that multiplied by itself gives 5.62; which is the uniform system number.

Example 2.—Let the focal distance be 4.36 inches and the aperture of the diaphragm 0.102 of an inch. Then 4.36 divided by 4 times 0.102 gives 10.70, and that multiplied by itself gives 114.5; which is the uniform system number.

PROBLEM III.—To find the time of exposure for a tolerably distant object with the diaphragm $f/4$. *Rule.*—By trial



PORTRAIT STUDY.

BY J. WELLS CHAMPNEY.

find the time of exposure with any convenient diaphragm, and divide that time by the uniform system number of the diaphragm employed.

Example 1.—With a wet collodion plate and a diaphragm whose uniform system number was 543, the time of exposure upon an open landscape illuminated by the sun shining through thin clouds was 217 seconds. Dividing that time by 543 gives 0.400 of a second for the time of exposure with the diaphragm $f/4$.

Example 2.—With a Carbutt B 20 gelatine plate and a diaphragm whose uniform system number was 62.0, the time of exposure on a well lighted interior was 220 seconds about 3 P.M. on a sunny day in June. Dividing 220 by 62 gives 3.55 seconds for the time of exposure with the diaphragm $f/4$.

Problem IV.—Knowing the time of exposure for a distant object with the diaphragm $f/4$, to find the time for any other diaphragm whose uniform system number is given. *Rule.*—Multiply the time of exposure for $f/4$ by the uniform system number.

Example 1.—For an open landscape and a gelatine plate, the exposure time with diaphragm $f/4$ is 0.02 of a second. Required, the time for a diaphragm whose uniform system number is 7.45. Multiplying 0.02 by 7.45 gives 0.149 of a second; which is the required time.

Example 2.—For a landscape under trees the exposure time for diaphragm $f/4$ is 10 seconds. Required, the time for the diaphragm whose uniform system number is 5.62. Multiplying 10 by 5.62 gives 56.2 seconds; which is the required time.

Problem V.—To find the exposure co-efficient for the diaphragm $f/4$ when the lens is used for copying negatives, drawings, etc. *Rule.*—By trial, find the time of exposure with any convenient diaphragm. Divide the size of the copy by the size of the original, add one to the quotient, and square the sum. Multiply the squared sum by the uniform system number of the diaphragm employed and divide the observed time of exposure by the product. The quotient will be the exposure co-efficient for the diaphragm $f/4$.

Example.—In making lantern-slides with wet collodion



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"ENRAPTURED."

plates from good negatives placed behind a sheet of ground glass on which the sun shone brightly, the time of exposure ranged from 20 to 45 seconds, according to the density of the negative. The diaphragm employed was number 61.9 of the uniform system, and the quotient obtained by dividing the size of the image on the lantern-slide by the size of the image on the negative was 0.84. Adding 1 to the quotient gives 1.84, the square of which is 3.39. Then 3.39 multiplied by 61.9 gives 210, and the exposure co-efficient for the diaphragm $f/4$ varied from 20 seconds divided by 210, giving 0.095 of a second, to 45 seconds divided by 210, giving 0.214 of a second. It will assist the memory to note that these co-efficients are from 0.6 to 1.3 times the exposure time which would be required with number 1 diaphragm on a well lighted landscape.

Problem VI.—Knowing the exposure co-efficient for the diaphragm $f/4$, to find the time of exposure required for copying a negative, drawing, or other object. *Rule.*—Divide the size of the copy by the size of the original, add 1 to the quotient and square the sum. Multiply the squared sum by the uniform system number of the diaphragm used and by the exposure co-efficient for diaphragm $f/4$. The product will be the required time of exposure.

Example 1.—A wet collodion negative, half the size of the original, is to be made from a pencil drawing on white paper, upon which the sun is shining brightly. A diaphragm of uniform system number 64 is to be used, and the exposure co-efficient for $f/4$ is 0.050 of a second. Here (1 + 0.5) squared gives 2.25, and that multiplied by 64 and by 0.050 gives 7.20 seconds for the exposure time.

Example 2.—A gelatine positive, three times the size of the original, is to be made from a negative placed immediately behind a sheet of ground glass on which the sun is shining brightly. A diaphragm of uniform system number 30 is to be used, and the exposure co-efficient for $f/4$ is 0.020 of a second. Here (3 + 1) squared gives 16, and that multiplied by 30 and by 0.02 gives 9.6 seconds for the required time of exposure.

The Photographic Society's standard lens flanges com-

mence with a diameter of one inch, and increase, first by quarter inches up to a diameter of 2.5 inches, then by half inches up to a diameter of 4 inches, and after that by inches up to any size that may be necessary. For diameters between 1 and 3 inches the screws have 24 threads per inch, and from 3.5 inches upwards they have 12 threads per inch.

The sizes selected for the diameters are judicious, and should meet with general adoption; but the same can scarcely be said of the pitches of the threads. No screw has met with more universal acceptance than that of the Royal Microscopical Society of London for the objectives of microscopes, and it has 36 threads per inch, with a diameter of 0.80 of an inch. Judging from that, and, indeed, from the whole average practice of the scientific world, 24 threads per inch is too coarse for a screw of 1 inch diameter, and too fine for one of 3 inches diameter. Furthermore, nothing is gained by using the same pitch with screws of different diameters because each diameter must have its own flange. The following system of pitches would certainly be nearer the average practice of the great instrument makers than that adopted by the Photographic Society:

Diameter in Inches.	Threads, per Inch.	Diameter in Inches.	Threads, per Inch.
1.00	34	2.50	22
1.25	32	3.00	19
1.50	30	3.50	16
1.75	28	4 00	14
2.00	26	5.00	12
2 25	24	6.00	10

The Photographic Society recommends that all screws fitted to cameras for attaching them to stands, and for fixing rising fronts and other moveable parts, be either 3/16, 1/4, 5/16 or 3/8 of an inch in external diameter, and that the pitch and shape of the threads conform to the Whitworth standards for these sizes. Here, again, the diameters are satisfactory, but, except for attaching cameras to stands, the Whitworth threads are certainly objectionable. They are universally adopted in the engineering trades, but they have

never been accepted by instrument makers because they are much too coarse for instrument work. Unfortunately there is considerable diversity in the practice of different firms, but the following table will enable the reader to understand the situation :

Diameter of Screw in Inches.	3/16	1/4	5/16	3/8
Number of Threads, per inch:—				
Whitworth's pitch	24	20	18	16
Astronomical pitch	39	32	27	24
Intermediate pitch.	32	26	22	20

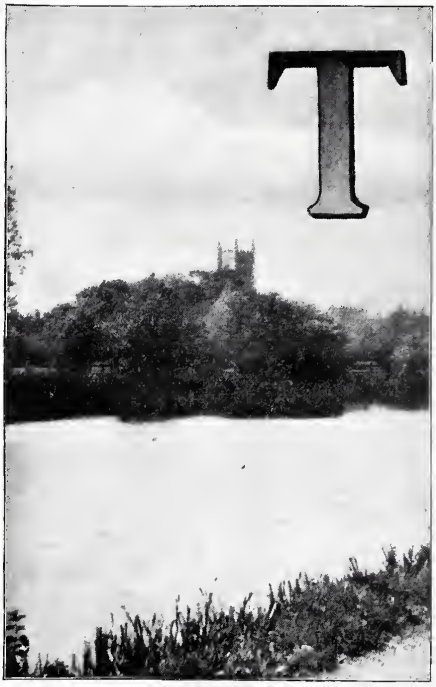
The numbers given as the astronomical pitch are approximately the average of those used by the most celebrated makers of large astronomical instruments. Considering the rough usage to which cameras are subjected, the astronomical pitches are probably about as much too fine as Whitworth's are too coarse, and, therefore, an intermediate pitch has been added which is more likely to be satisfactory than either of the others.



PORTRAIT. By J. F. RYDER

IN CONSTABLE'S COUNTRY.

BY J. CARPENTER.



THE VALE OF DEDHAM. By J. CARPENTER.

THE few pictures sent herewith are reminiscences of a hurried visit in the early part of the present year to Constable's Country.

This, as many of the readers of the ANNUAL will know, is situated in the Valley of the Stour, and was the birthplace of the celebrated painter, Constable. To those who delight in quiet pastoral landscape scenery, I cannot recommend them to a more beautiful spot.

The Valley of the Stour abounds in pictures of the most charming character. Many days may be spent in the meadow and marshy lands about Dedham along the banks of the stream, and any number of delightful bits may be secured both by the artist and the photographer.

The quaint wooden bridges are typical of the River Stour, and are still in the same condition as when painted by Constable.

His painting, "The River Stour," includes Flatford Bridge.

His "Lock on the Stour," is also Flatford, and is at once localized by the rustic wooden bridge, with old thatched cottage at one end and Dedham Church showing through



Engraved by J. Manz & Co., Chicago.

BRIDGE ON THE STOUR.

BY J. CARPENTER.

the trees in the distance, idealized, of course, but still recognizable.

The Vale of Dedham is very lovely and full of possibil-



'IN CONSTABLE'S COUNTRY." By J. CARPENTER.

ities in the way of picture making. The quiet stream flows through meadows bordered with willows, and the marshy



FLATFORD BRIDGE. By J. CARPENTER.



"ON THE STOUR." By J. CARPENTER.

lands abound in reeds and bowers interesting alike to the photographer and the botanist.

The station for Dedham is Manningtree, on the G. E. Railway, and in concluding these very scant notes I can safely recommend a visit to Constable's Country.



"ON THE HILLSIDE." By G. E. VALLEAU.



PORTRAIT STUDY.

BY W. G. CHASE.

Engraved by J. Manz & Co., Chicago.

ROENTGEN'S DISCOVERY.

BY J. STOGDELL STOKES.

PERHAPS no branch of human activity has made such rapid advances within the last few years as photography. New lenses, new cameras, papers, plates and processes have followed each other at a pace, which athletically speaking, would be termed "hard and fast." But the past year will ever be memorable for the great discovery of Prof. Roentgen. The whole scientific world has turned its attention to a little laboratory in Würzburg with a unanimity never before equalled.



RADIOGRAPH OF A TORTOISE.

All skepticism was at once dispelled by the scholarly paper read by Prof. Roentgen, in December, before the Physical and Medical Society of Würzburg, announcing the discovery.

Its treatment of the subject was admirable in every respect, and gave evidence of a close and scientific study of the new phenomena, which marked the man at once as worthy of the fame which will ever be his.

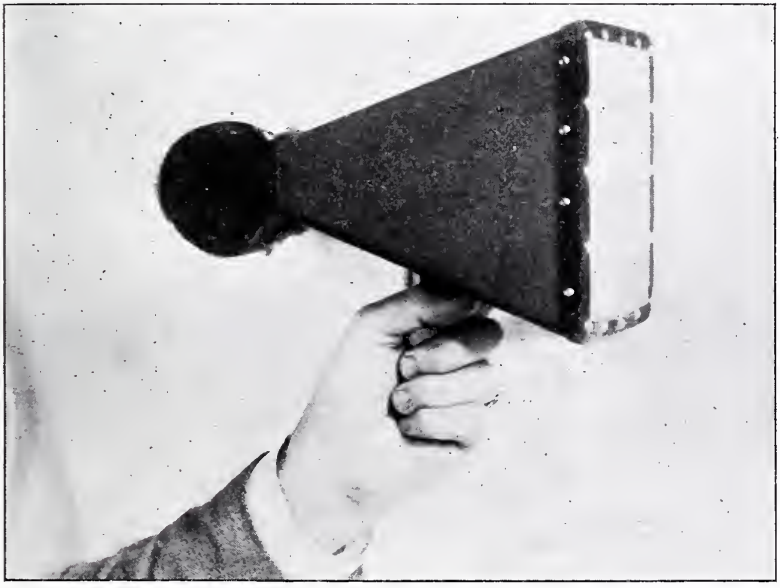
Born in 1845, he was educated at the University of Zurich, where he took his Doctor's degree. Since, he has held professorships at Strasburg, Hohenheim, Giesen, and Würzburg.



RADIOGRAPH OF A HAND.

It might be interesting to add that while Professor of Physics at Strasburg, Tesla was doing electrical work there, and Paderewski was Professor of Music. Of these three great men, Roentgen has been the last to reach fame. Although little known in America, he has long been held in esteem in scientific circles abroad, and his work in this field has attracted some attention before the discovery was made.

The apparatus employed was such as could be found in any physical laboratory, and his experiments were rapidly



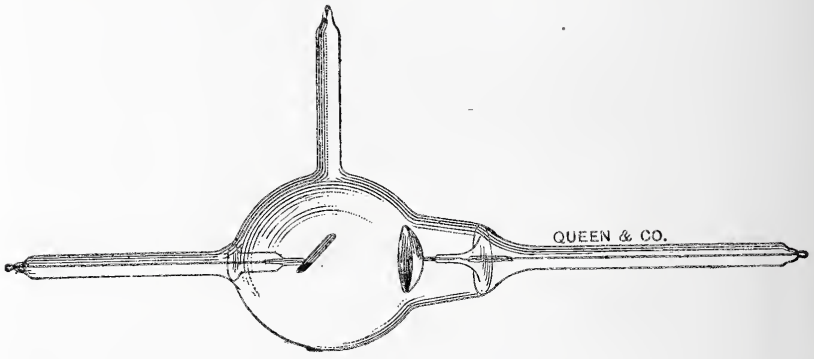
EDISON'S FLUOROSCOPE.

repeated in all parts of the world. The weird and uncanny revelations of the bony structure, the mystery of seeing through opaque material, so to speak, appealed in an unprecedented manner to the unscientific public.

Since the announcement of the discovery a careful study of the conditions most favorable to good results has greatly reduced the time of exposure, and increased the penetration of the rays.

This is due, in the first place, to the use of the so-called focus tube (see illustration), in which the cathode rays, coming off normal to the concave surface of an aluminum cathode, are brought to a focus on a platinum anode. From this point X rays of great force appear to start, and consequently a sharp, well defined radiograph is quickly obtained. Another great advance has been made in the manner of exciting the tubes.

The Tesla disruptive coil has proven much better than other coils, for the reason that a current of high potential and great frequency is supplied without a large amount of current, which is destructive of the tubes. The exact degree



THE QUEEN FOCUS CROOKES TUBE.

of exhaust in the Crookes tube must be held, and when a large current passes through the anode becomes red hot at the focus point, and the vacuum gradually changes. This difficulty is largely overcome by the disruptive coil, while the advantages of high potential and great frequency are added.

Dry plate makers have done their share in the advancement by preparing emulsions particularly adapted to the purpose. Indeed it must be admitted that the photographic plate is about the only link between regular photography and radiography, and even this link is threatened by the use of the fluoroscope (see illustration). This consists of a box, shaped at one end to fit the face in such a manner as to

exclude light, and having at the other a screen of some fluorescent salt, preferably calcium tungstate crystals. When a hand or other object is held before the screen between it and the Crookes tube, the radiograph is visible. The crystals make the surface of the screen more or less rough, and consequently the radiographs from negatives are much clearer and sharper, but the great quickness and convenience of the fluoroscope will make it particularly useful to surgeons and physicians.

It has been stated that radiographs are "mere shadow projections," but they are far more. Every tissue, every irregularity of surface and difference of density has its effect upon the rays as they stream through.

How much of this is recorded on the plate depends on many conditions, but it can easily be seen that the resulting radiograph is far different from a "mere shadow projection;" in fact, it almost approaches a photograph in point of detail.

As to the real character of the rays, their place in the world of physics seem still uncertain. The idea that they are really streams of material particles projected with tremendous velocity is well supported in many respects, but it can not yet be said to be generally accepted. In this respect it is interesting to note the remarks of England's greatest scientist, Lord Kelvin, at the recent jubilee in his honor.

"One word," he said, "characterizes the most strenuous of the efforts for the advancement of science that I have made perseveringly during fifty-five years. That word is failure. I know no more of electric and magnetic force, or of the relation between either electricity and ponderable matter, or of chemical affinity than I knew and tried to teach to my students of natural philosophy fifty years ago in my first session as professor."

Perhaps it may be some time before the world knows much about X rays.

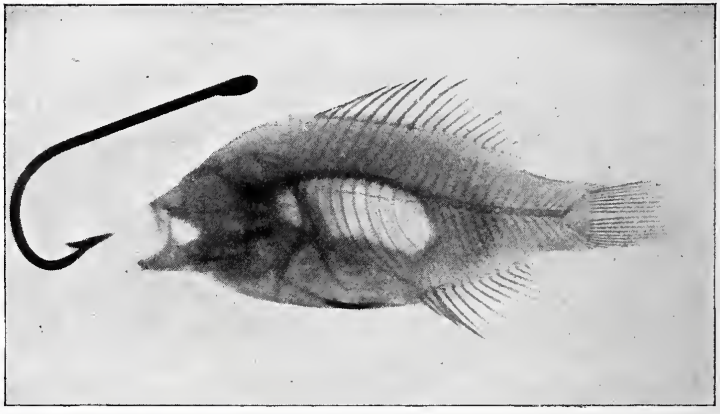
At once when the discovery was announced it became apparent that it was to be of great use in surgery, and its usefulness is constantly growing in this direction.

To see the broken bones of an arm after it has been set in wooden splints and tightly wrapped in bandages, without

removing anything, some months back would have been thought "beyond the realms of reality." But beyond the location of foreign bodies and the examination of the bony structure, its use is now extending. It is passing in from surgery to medicine.

The soft parts of the body are now being successfully reproduced, and physicians have at their disposal a new method of diagnosis.

Dr. William J. Morton, in an article read before the Medical Society of the County of New York, in April, has the following: "Under-exposure gives a negative which is full of delicate, ghost-like, and yet clearly defined outlines



Radiograph taken by Messrs. Leeds & Stokes, February 21st, 1896.

of skin, muscle, tendon, veins, and arteries; negatives of the latter type are far stronger and more startling to the investigator than the mere crude outlines of bones. The mind walks in among the tissues themselves. It is their ghost or astral form that stands depicted. But stranger still are the revelations of looking through the living fleshly body by aid of the fluoroscope. First are seen the vertebræ, the greater bones, the ribs, and then to the astonished gaze, in dark outline, but moving, may be seen the beating of the heart, the rise and fall of the ribs in respiration, and the movements and rhythmical displacement of organs. I have seen

these organs plainly outlined, and noted changes in density due to disease."

Since this paper was written further advances in this line have been made. The great problem before the investigator is how to make the rays more selective, that slighter differences in tissues may be revealed, and the outlook is very encouraging. Every one who has observed the action of X rays closely has noticed that at times the penetration is very great. Bones themselves seem hardly to make a shadow, while at other times the flesh is almost as opaque as the bones.

Certain conditions prevail at times that cannot be explained, which affect the manner the tubes act to a marked degree. It cannot be long before these conditions are more perfectly understood, and better and better results will be obtained.

When we consider how recently the discovery was made, and how far it has advanced, we can hardly imagine where it will lead us when "age performs the promises of youth."



LOW TIDE. By L. C. BENNET.



Copyright, 1896. By Baker's Art Gallery, Col. O.

Central Bureau of Engraving.

QUEEN OF THE NIGHT.



LA MADRILENA.

PHOTO COLORTYPE CO.
Chicago & New York.

THE THREE PRIMARY COLORS
TRADE MARK.

ART IN GROUPING OF FIGURES AS APPLIED TO PHOTOGRAPHY.

BY S. HEMINGWAY, M.D.

IF we will stop a moment and study art as exemplified by the great masters, as will be shown by the illustrations in this article, we will see that the scheme, or rather the form, of producing art is of necessity divided into certain forms. The simplest of these forms is exemplified by that of Murillo's "Immaculate Conception," Fig. 1, which of itself is a simple demonstration of the angular forms of composition. Now, therefore, in taking this illustration as an evidence of artistic work, it shows conclusively that the angles are the essential part of the work. When we look upon any subject in the way of art, we look upon it in the point of pleasure that there is to be gained thereby.



FIG. 1.

Curves are but rounded angles. In this particular study it will be seen that the lines, as indicated in the reproductions, are such that the eye is relieved from all strain, because the vanishing point is within the center of the picture. Now, on the other hand, where we have the double triangle, as in illustration Fig. 2, we see that the grouping is such that the vanishing point is in the center; and in these classical studies, it will be shown later on, that the groupings of individuals, or subjects, is an essen-

tial part of the photographer, if he will produce, or desires to produce, perfect art.

Now, while there has been a demonstration of the angular part of work in illustration Fig. 2, we have what is called a circular composition; in reality the composition is within a circle in Fig. 3.

While these laws are laws of art, it is an unfortunate thing that the photographer does not recognize the fact that the lines, curves, angles, and the like, make up a part of his work. He goes haphazard and takes whatever he can get, no matter what it is, without thought as to the result.



FIG. 2.

Now, for instance, Fig. 4; here is a composition on what is called the oblique; that is to say, that this composition, or picture, is formed in such a way that while the center of the picture is in the center, the auxiliaries, or side parts of the picture are as important a part as the picture itself. It is evident, therefore, that a man shall understand, in taking a picture, whether it be a human being or a landscape, that he shall be cognizant of the fact that the original lines, curves, beauty, and the like, exist to-day as they did years ago; that the "Venus de Milo" can be reproduced to-day, there is no question—none, whatever.

It is hesitancy in art. Many reproductions that have been made are poor simply because there is lack of appreciation of art as it exists to-day

We will, then, take as a demonstration of the fact, a landscape. The landscape has its points of vision and its points of disappearance. As, for instance, we take the figure of an individual lying face down in the sand, or elsewhere, and, as will be seen by the illustration, Fig. 5, that while there are curves, they can be called at the same time angles, and, as a result, we can have as perfect a picture as the artist may seek or desire. So, in the end, it is simply this: if one has a proper conception of what constitutes art, he he will be enabled, knowing beforehand what he wishes to accomplish, to so gronp his figures, that the result will be pleasant not only to himself but to everyone who may look upon his pictures.



FIG. 3.

These few points are given simply with the idea that in a composition any photographer, while one may not seek to attain the highest possible height, might thereby be able to produce such work that will not alone be a pleasure to himself but to his friends. With these few hints, and with the illustrations that are given in the article, there should be a better appreciation as to what constitutes the real, especial points as to composition in art. It is absurd to think, for a moment, that these pictures were accidental because they so contain the idea of composition; so, then, having composition in view, as properly dictated by the older masters and shown in the "Sistine Madonna," that one may seriously consider before taking a picture.

The perseverance and intelligence as shown by our

English friends is so great that we can readily afford to put in three or four hours a day for several days till we have acquired a grouping that is to our satisfaction.

The angles may be variously placed, that is, the single angle may be vertical, horizontal or inverted.

In the whole matter of art, composition is, of necessity, an essential part. In the half section of the human body, in the horizontal position (not vertical), it will be seen that the curves, conformations, and the like, are such that they really represent outstanding hills in the reproduction in part from Dr. Rimmer's "Art Anatomy."



FIG. 4.

In the reproduction of the painting representing sunset at Cohasset, Fig. 6, every detail has been duly considered. It is a rough sketch of a picture by the late Alfred Perkins, and if you will for a moment consider the diversion of vision, as is actually compelled by the angles of the picture, it will be seen that it is impossible, that the eye cannot, for a moment, literally rest upon any one especial point.

The eye is susceptible to influences of all kinds. If, then, there is a picture before an individual which has several angles, or curves, it necessarily follows, that by the diverting of the eye from the especial center of the picture all strain disappears; at the same time, unconsciously, the eye rests upon the center of the picture, but, as before mentioned, it is, to a certain extent, diverted by the outstanding lines.

Where one will see a picture and is immediately on seeing

it dissatisfied, it lacks that essential thing which is called quality. Before all things quality should exist in all pictures. Quality is that essential factor which distinguishes one picture from another.

If a picture has quality it speaks to you, and, governed by your environments, it appeals to you in its especial quality.

That pictures cannot appeal alike to all men is shown by the remarks of a very distinguished orator of the United States. Take the man, for instance, at the seashore. One passes along the beach; the hymnal, cadence, grandeur of surf all appeal to God as the grand Artificer of the universe. The man stands enthralled; the cadence of the waves and the general hymnal compels him to stand there entranced, unable for expression.



FIG. 5.

Another man comes along. He looks out on the sea and waves; what was a hymn of joy to the first man was a hymn of grief to the second one, because it inspired in him thoughts of the death of his wife and children on ship. Where in one case it was a hymnal of joy, in the other case it was a dirge.

The third man looking for drift-wood condemns the sea,

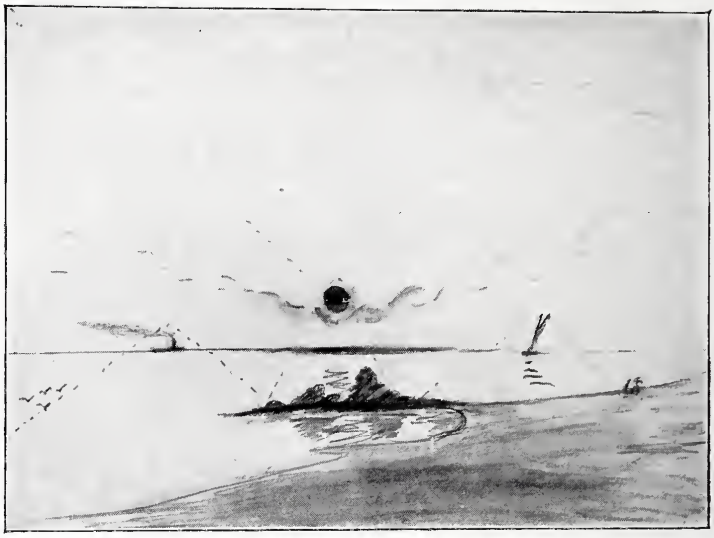


FIG. 6.

the earth, the sky, and everything, because there was no drift-wood for him, and he saw no sentiment in the whole scene.

So, therefore, our own environment and education must govern us in our appreciation and composition of pictures. Our own associations will do the same, but the artistic sentiment should be so strong that we can rise beyond personal sentiment and seek to produce what is great.

A consideration of the men in the past and the present who have achieved the greatest distinction in photographic art—it will be found they primarily were artists or art students, or those in whom the art instinct was innate.

If, in the horizontal picture of the human body, the reader will place a piece of white paper abutting on the line of section he will have the effect of distant hills, which can be further elaborated by placing a small circle at the point of greatest concavity, and by placing a ship or so on horizon line or below it have a fair seascape, with lines indicating the reflection of the circle. Huxley has said there is no intrinsic beauty in a flower, for the clodhopper will crush it under his feet without thought of its beauty or aroma. In the same flower uncrushed a botanist, a connoiseur will

find unutterable pleasure. Therefore, education into the vast depths of the beauties of nature is a necessity, and is governed by our environment. Once learned, the sky, clouds, landscape, everything in fact, is a study of most magnificent and constantly changing beauty.

TURPENTINE AND HYDROCHINONE.

BY MILTON E. PUNNETT.



"TO THE DEATH."
By MARIO DEI FIORI.

IT is said that a few drops of oil of turpentine added to a hydrochinone developer acts as a powerful accelerator. For over two years the above legend has cropped up occasionally in the photographic papers and no one has seen fit to gainsay or indorse it. Below I give the results of three experiments made with Seed plates and Seed's ready mixed hydrochinone developer.

To 1½ ounces of developer I added 20 drops of turpentine. It made the plate greasy, rejected the developer in spots and gave a *reversed* image. Same amount of developer with 2 drops gave a spotty negative and no signs of acceleration. To 1 ounce of developer I added 1 ounce of alcohol and 16 drops of turpentine. The alcohol was added to make the turpentine take more kindly to the water of the developer. No signs of acceleration were shown, and the film after fixing was somewhat milky.

The first experiment in which the reversed image was produced, I thought might be of a general scientific interest, so I have recorded it here. The conclusion might also be drawn from it, that there was some truth in the "legend," but the total results did not seem encouraging enough to make one continue the experiments.

PHOTOGRAPHY WITHOUT A LENS.

BY F. PAUL LIESEGANG.

IT really seems useless to write about "photographing without a lens," for more has probably been written on this subject than the subject is worth.

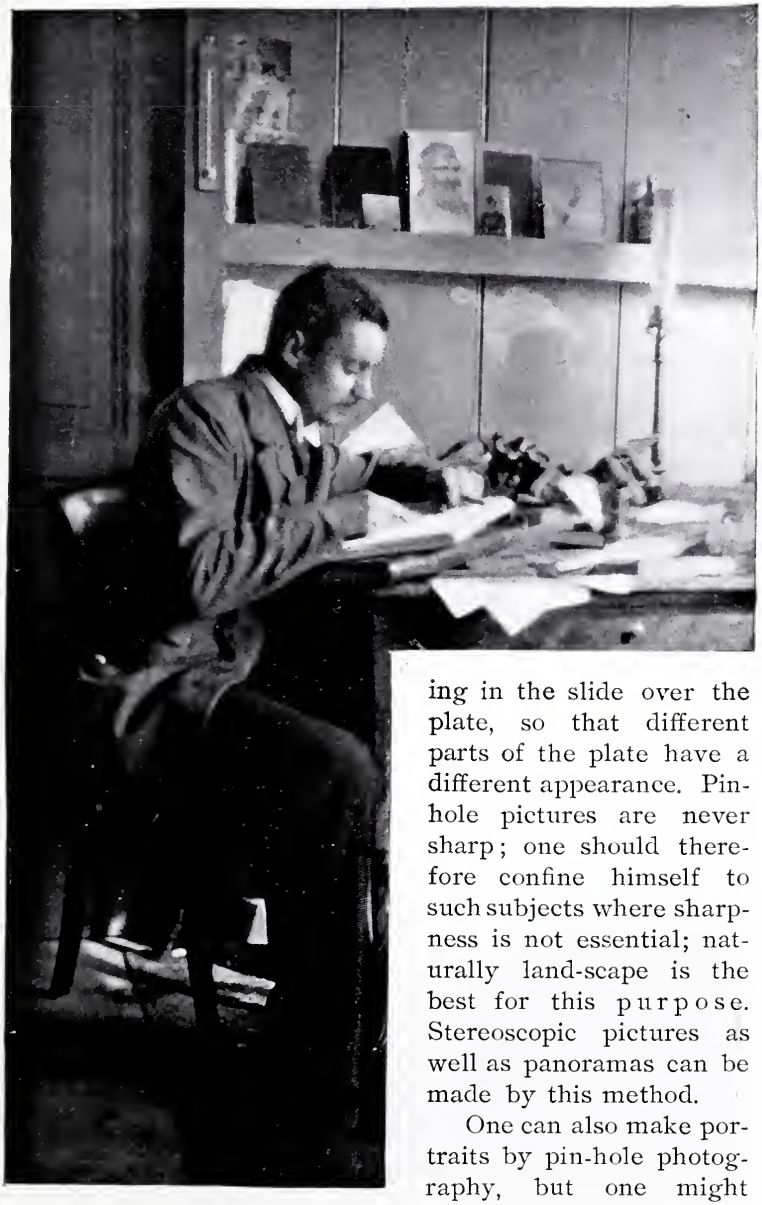
Photography without a lens is a condition which every one has gone through, or will go through, who busies himself with the beautiful art of picture making. One becomes interested, one is surprised at the unexpected results, and from then on makes negatives without a lens only, but this lasts for a few weeks only. Some one asks, "Why this roundabout method of making poor pictures"? It is just like Diogenes, who threw away his cup and drank out of his hollow hands in order to be able to do so if occasion required. The only remarkable thing about these pictures is that they are made without a lens, and if one shows such a picture it is always necessary to state this fact. Even the most enthusiastic "pin-hole" photographer soon tires of it and throws his Pin-hole Camera into the attic where it belongs.

The following remarks, however, should be of interest to those amateurs who are about to reach or are just now in the "pin-hole" state.

The pin-hole one can make himself. I have tried every possible method and material. The simplest of all is to pierce a hole, with a red-hot needle through a piece of black paper, and gives as good results as the most complicated methods. There are formulæ for determining the length of the bellows in relation to the size of the hole. In practice these formulæ are worthless—an opening of say one-fiftieth of an inch is applicable to all cases. If one desires to make larger pictures where absolute sharpness is not necessary, one can use an opening of one-twenty-fifth of an inch.

The shape of the opening is immaterial, it may be round, square or triangular, only it must be uniform, for if the opening is not uniform the picture will be distorted.

The correct exposure one must learn by experience; if one has no idea on this subject, one can, by gradually push-



PIN-HOLE PORTRAIT.

ing in the slide over the plate, so that different parts of the plate have a different appearance. Pin-hole pictures are never sharp; one should therefore confine himself to such subjects where sharpness is not essential; naturally land-scape is the best for this purpose. Stereoscopic pictures as well as panoramas can be made by this method.

One can also make portraits by pin-hole photography, but one might have difficulty in getting



PIN-HOLE LANDSCAPE.

a person to sit long enough to accomplish that result. I could get no one myself, and so had to be my own subject. To do this one focuses his camera, places his plateholder in place, opens it, and then sits down at the point focused and starts to read *The Photographic Times*. When you think you have sat long enough, get up and close your plateholder. The accompanying illustration was made in winter, by comparatively poor light, exposure six minutes. Under better circumstances the exposure can naturally be shortened. A picture like this is a good means to thoroughly teach the unfavorable side of pine-hole work.

For photographing wood-cuts, drawings, etc., for which pin-hole photography has been recommended, it is hardly to be used; the pictures become flat. In general, pin-hole pictures show little contrast; if one wishes to have contrast, one must make the exposure in the most glaring illumination.



A COOL RETREAT. By HOWARD GREY DOUGLAS.

LINEAR PERSPECTIVE.

BY W. H. SHERMAN.

THE art of linear perspective consists in projecting upon a vertical plain objects resting upon a horizontal plain so that they shall appear in their proper places, shapes and relative proportions, as if seen from a given point. This art is of recent date, not having been known until the fifteenth century, and it is a curious fact that many famous buildings are now standing which the architects who designed them, and under whose direction they were built, could not have drawn in perspective had they been offered for doing so ten times the price paid for their eminent services. Such are the cathedrals of Florence, Milan, Cologne, and numerous others.

Now, the photographer trusts his lens and camera of approved construction for accomplishing what was then impossible. Given a judiciously chosen standpoint, the right lens for the proposed work, a well-chosen effect of light and shade, and the rest is not difficult to do.

There are probably more faults in views, due to their being taken from the wrong point, than from any other cause whatever; and it is not unfrequently that such faults are charged to some defect of the lens, as for instance, too short a focus or too wide an angle, instead of to the want of something which the most competent optician is unable to supply—to wit, knowledge and skill in the use of the instruments which he furnishes. The fact is that neither shortness of focus nor wideness of angle has anything to do with the disproportion of one part to another. The longer focus—point of view being the same—gives a larger *scale, i.e.*, every object larger; the wider angle gives more objects and covers a larger plate than the narrow angle and same focal length. The lesser view will correspond exactly with the greater as far as it goes—no account being taken of lenses which give distorted lines. The wide-angle lens is made expressly for what it accomplishes, and if it includes too much, the excess is easily trimmed away. The wide angle (rectilinear, orthoscopic or astigmatic) is the most useful view lens ever made, invalua-

ble for interiors and cramped spaces; equally good in all situations, except where greater rapidity is essential.

In order to better understand the faults and excellences of perspectives it may be worth while to go over some of the elementary principles pertaining to the subject; to this end a few definitions will be in order:

GROUND PLANE.—The lowest horizontal plane on which objects rest which appear in the picture. This plane must be considered horizontal whether it conforms to the ground surface or not.

PLANE OF THE HORIZON.—Another horizontal plane cutting the eye or lens, and extending to the sensible horizon. This plane, being on a level with the eye throughout its whole extent can only be seen as a straight line, but the eye being above the ground plane the latter appears to rise until it meets the former. The line of intersection is called the HORIZON of the picture. Similarly all horizontal planes *above* the level of the eye appear to slope downwards until they meet the other two planes at the same line of intersection, whence this line is called the VANISHING LINE, as well as the horizon, of the picture.

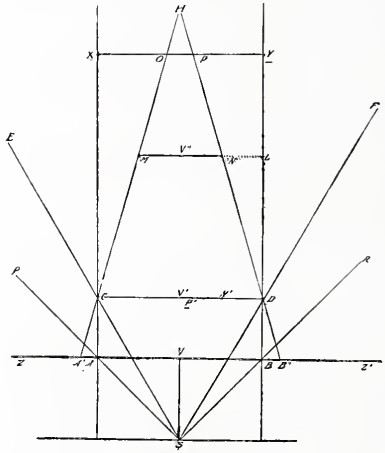


FIG. 1.

PICTURE PLANE.—A vertical plane intersecting the ground plane at right angles at the lowest points of the projection or picture. This line of intersection is called the BASE OR FUNDAMENTAL LINE. The horizon also lies in this plane parallel to the base and on a level with the eye.

CENTRE OF VISION.—Now, suppose a vertical plane cutting the eye and intersecting the picture plane at right angles, it will also cut all horizontal planes at right angles. Its line of intersection with the picture plane will be vertical,



EVENING. BY HOWARD GREY DOUGLAS.

its apparent intersection with the horizon plane will be a point—the CENTRE OF VISION. Furthermore, suppose another vertical plane perpendiclar to and intersecting with the picture plane at its extreme right, and yet another at its extreme left. As these two exterior vertical planes are seen by the eye they appear to converge and meet the central vertical plane in a vertical line. Where this vertical line meets the horizon there is the *vanishing point* of all parallel lines *perpendicular* to the picture plane. This vanishing point lying in the horizon and in the vertical plane passing through the eye perpendicular to the picture plane is no other than a point in the line drawn from the eye to infinity, can be seen only as a point—in fact represents at the same time the nearest and most distinct point in the view, interception of the latter of course excepted.

Parallel horizontal lines in front elevations have no vanishing point, and must be represented parallel. For the same reason vertical lines must appear vertical.

Apparent size of objects varies *inversely* as the distance If two objects are of equal linear size—*i.e.*, same height, width, etc.—the one that is twice, thrice, or four times, as far from the eye or lens, is half, one-third or one-quarter as large in the picture as the nearest. But the apparent size varies *directly* as the focal length. The objects and distances remaining the same as in the case last supposed, their images will have the *same* ratio as the focal length of the lenses used. A 16-inch focus will give an image four times as large as a 4-inch focus, twice as large as an 8-inch, and so on. Let AB*yx* represent the ground plane of a view to be taken of an interior. A plate of a certain size is to be covered and there are two lenses of the same focal length available for the purpose, one with an angle of 90 deg. and one of 60 deg. AB is *the base of the picture plane* equal in length to the given plate; S is *the point of view;* V *the centre of vision;* H the point in *the horizon* in the line SV produced, equal in height to both points, S and V (V and H being in the same horizontal plane with the eye are seen in the picture as one point). The lines A*x* and B*y* are intersections of the exterior vertical planes perpendicular to the extremities of the picture plane, and

the lines C*o* and D*p* represent the apparent convergence or perspective of the same. The points *op* meet beyond the picture in H, the common *vanishing point* of all lines perpendicular to the picture plane. In this case the exterior vertical planes mentioned are two walls of the room; the ground plane and highest horizontal plane are the floor and ceiling. The angle C S D and A S B are 60 and 90 deg. representing the field or capacity of the two lenses respectively.



FIG. 2.

How will the lenses behave in taking the required view? The answer is, that if both lenses are placed at the point S, and if each is capable of covering the plate used, the two views will be equal in every respect as far as scale, proportion and perspective are concerned. Each view will alike include the right and left walls of the room from D to *y* and from C to *x*. This is the full capacity of the 60 deg. lens. But the wide-angle lens, if given a plate large enough will include also the wall spaces from D to B and

from C to A. Therefore the picture begins with the base line C D equal to A B, where it would begin if the larger plate were used, in which case A B would become A′ B′. At the distance S V′ the cross section of the room is represented in the picture by the line C D, its apparent width; hence at the distance V S″, = S V′ × 2, the apparent width is *m n* one half of C D. The wall from D to L, is represented in the picture by *n′* D = *n* L and the entire wall D*y* occupies the picture from D to *p′* = *py*.



FIG. 3.

Outside views not being confined within the four exterior planes include all that is visible both in the horizontal and oblique vertical planes within the lines S P, S R or S E, S F, containing the view angle of the lens, the vanishing points whereof are all in the horison line Z Z′ within or without the picture.

There is a view of the Cathedral of Florence which is interesting as a study in perspective as well as for its historical associations, as being the largest building in the



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"RUTH."

world, dating back to the middle ages, and as being now the second largest cathedral in existence. It was designed by Arnolfo and commenced two hundred years before the discovery of America. It is hard to reconcile this picture with its immense size. One of our city blocks is 360 x 250 feet, covering 90,000 square feet, or more than two acres. This building covers 190,000 square feet, being 555 feet (more than one-tenth of a mile) long by 343 feet wide, covering more than four and one-third acres. The body of the cathedral, and especially the bell-tower, are very much dwarfed in appearance, undoubtedly due to the unfavorable location of lens, and probably this was the best position to be had. Evidently it was taken in close quarters with a very wide-angle lens, for the sake of securing both buildings entire in one view. The point of view was too high for the best effect. The bell-tower, which is 292 feet high, would appear twice as imposing if taken from near the ground. As it is, the top pitches down too much, and the ground rises too sharply, due to both nearness and height of standpoint. It will be seen that the horizon of the picture passes through the middle section of the second story of the Campanile, where two straight lines on two adjacent sides meet and form one straight line, which coincides with the cornice of the apse—probably 75 feet or more above the ground. The total result is certainly disappointing, and yet no doubt the photographer made the most of a difficult task under the circumstances. But it is certain that the drawing is bad enough to at least suggest a suspicion that the lens



Fig. 4. THE CATHEDRAL OF FLORENCE.

was no better than it ought to have been, for it is impossible to find a common line in which the paralled lines in the view (or what stand for parallel lines) will meet.

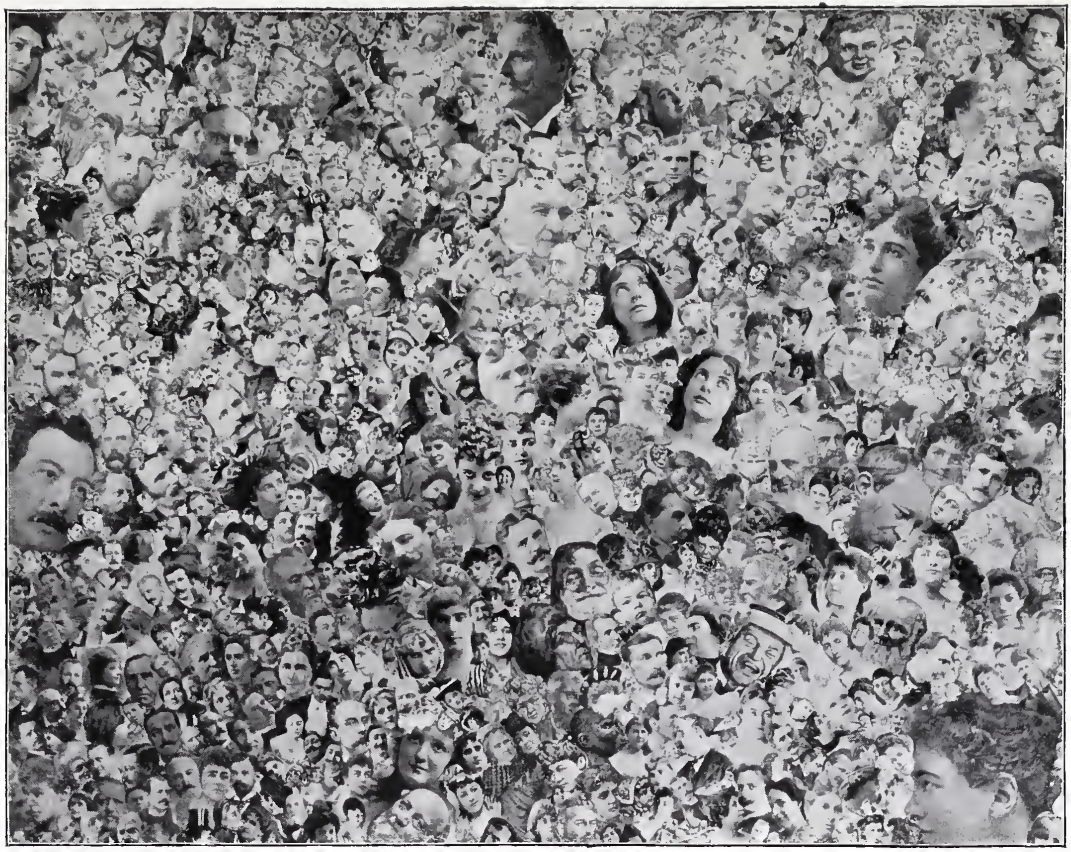
A second view of the church and Campanile as seen from a considerable distance over the tops of high buildings between it and the church of Orsanmichele, gives a much more satisfactory idea (as far as seen) of the vastness of the one and the beauty of the other. The horizon plane in this is on a level with the base of the dome, a little above the third story of the tower—about 150 feet high, and cuts the foot hills of the Appenines, which rise above it. This view is interesting because it shows the scaffolding on the west end of the church—the facade. This front was never finished until after 1875, as this view was probably taken twenty-one years ago, soon after the work was recommenced.

The third view is a fine perspective of the finished facade and Campanile, which last was commenced in 1334, and which Ruskin says is the most beautiful building in the world. Built of marble, porphyry and jasper.

A-HEAD OF ALL CREATION.

BY J. A. BATES.

THE much-maligned "Amatoor fottygraffer" may take the cake for senseless blunders and colossal obtuseness; yet, after all, he is not really so dull and slow as he looks, and when he gets mad and right down to business it doesn't take him the wink of an eye to get ahead of all creation. Just, for curiosity, count the heads in this picture and see if any one you know, or ever heard of, was left out. This work of arts was produced by cutting out each and every head from magazines, papers, etc., cleverly grouping and pasting on a large sheet of cardboard, and then photographing. Easy, when you know how, but lot's of work.

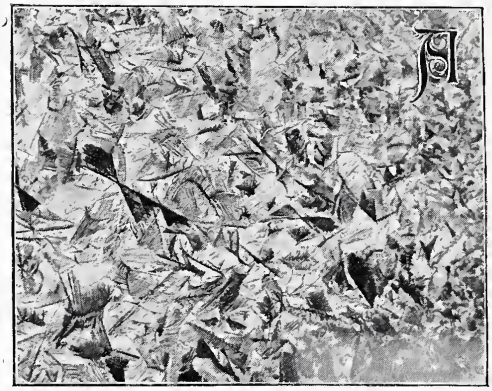


A-HEAD OF ALL CREATION.

BY J. A. BATES.

PHOTOGRAPHY AND CRYSTALLIZATION.

BY JAMES LEADBEATER.



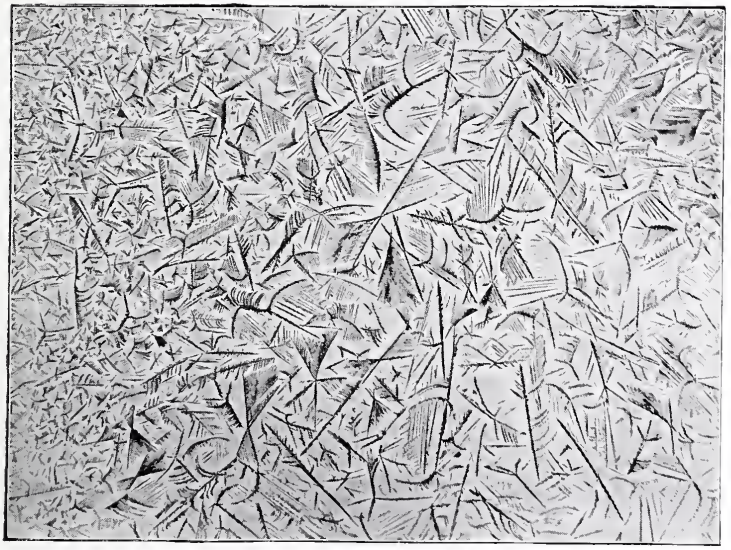
POTASSIUM FERRIDCYANIDE.

As an antidote against, or relief from the general run of photography, that is the universally photographing landscape and seascape (and who amongst us does not sometimes get tired of these and look out for other fields and pastures new?) I would advise amateurs to take in hand more scientific subjects, and amongst others would suggest the photographing of salt crystals as one giving a maximum of pleasure and enjoyment with a minimum of cost.

In an article published in your valuable magazine in April last upon Photography and Crystallization, I referred more especially to ice crystallization on window panes. For this kind of photography of course you have to wait until nature supplies you with material to work upon, and with our ever varying climate in England, sometimes the opportunities are few and far between. But it is not so in the case of salt crystals, for they at any time are easily made and you can procure an endless form of variation.

With salt crystals you can also get a wonderful variety of design, for no two salts give the same pattern. In fact by altering the strength of the solution you obtain a different design, even with the same salt, and by mixing two or more salts in certain proportions, you get some remarkable combinations of crystallizations.

The preparation of these salts for crystallization and photographic purposes is exceedingly simple. Make, say saturated solutions of them by dissolving in hot water as



POTASSIUM FERRO-CYANIDE.

much of the salt as the water will take up. In the list I have given of the suitable salts for crystallization those marked A should be dissolved in alcohol. If a little sugar is added, or if the salts are dissolved in beer it will tend to fasten the crystals more permanently on the glass, when the solution has dried, and the crystallization has taken place. It will also act as a preventative against the crystals running while being subjected to the heat in the lantern.

Having your solution in readiness, procure some pieces of clean glass quarter or half-plate (according to the size of the condensers in your enlarging lantern) and coat them with the salt solutions, either with a camel hair brush or by holding the glass level between the thumb and finger, and pouring the solution on the glass, the same way as you would coat a plate with collodion. After letting it drain a little while, lay it down upon a level stand for the crystallization to take place. Some salts crystallize quicker than others; it also depending upon the thickness of the coating. Crystallization is accelerated by warming the plate before and after coating. I find the salts which are dissolved in alcohol

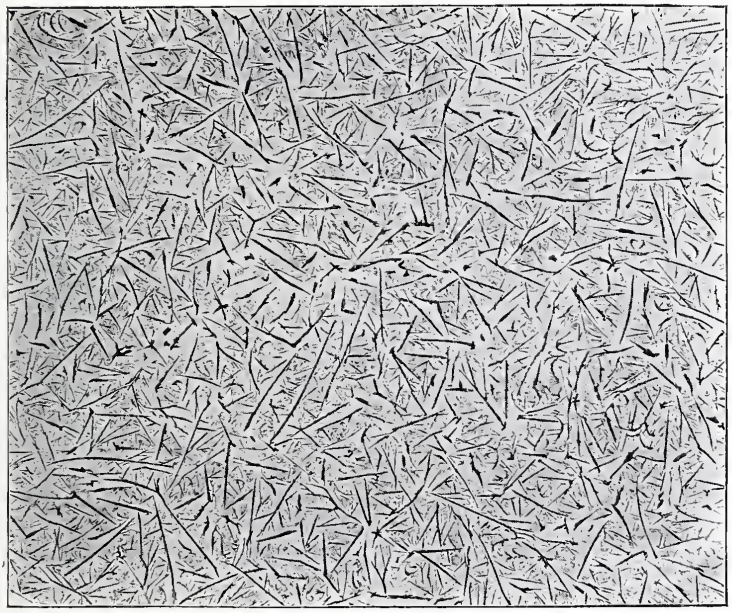


AMMONIUM CHLORIDE.

crystallize much quicker than those mixed with water, as the spirit sooner evaporates.

In order to photograph salt crystals you require an enlarging lantern, so that when the salts are crystallized on the pieces of glass you put the plate into the lantern and take a negative from it, just in the same manner as you would take an ordinary enlargement; or if you are not possessed of an enlarging lantern you can take a negative of the crystals by contact in the usual manner.

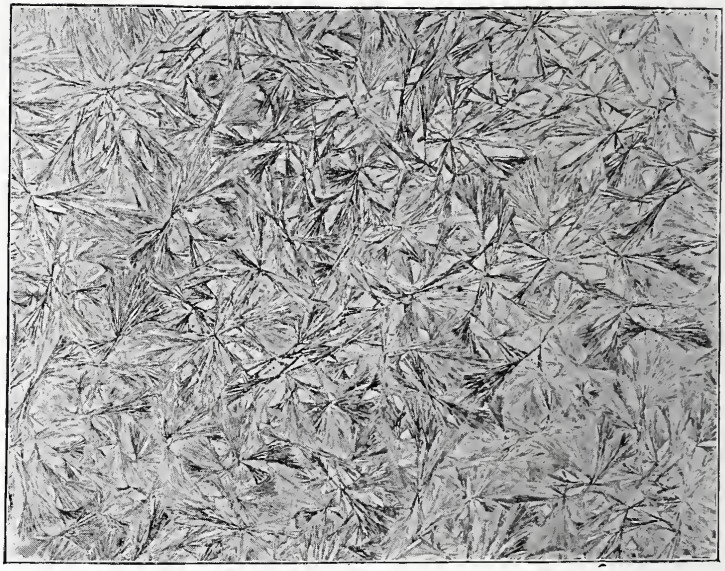
You will notice in some of the illustrations to this article a few of them are described as being obliquely lighted; this can only be done by the aid of a lantern. In order to get the crystals so lighted you must take the light out of the centre of the condenser by lifting or lowering it. Another way is by fixing the stop of the objective (if it is fitted with Waterhouse diaphragms) about half way across the lens so as to cut the light off the centre of the object glass, allowing it to come partly through the hole in the diaphragm and through



POTASSIUM FERRO-CYANIDE.

the bottom portion of the lens. By these simple means you get an unequal reflection of the light which gives a peculiar illumination to the crystals, imparting to them not only a depth but a fluorescent effect which is better seen than described.

Dr. Carpenter, in his work on the microscope, recommends microscopists to work in this direction. I think if it is useful to them it is also of use to photographers, for as he says: "In this branch there are many chemical, and mineral substances too, which give us a great variety of both interesting and beautiful objects, some for their diversity and wonderful forms, others for their elegance and beauty." The natural forms of such substances when in any way symmetrical are so in virtue of that peculiar arrangement of their particles which is termed crystallization, and each substance which crystallizes at all does so after a certain type or plan, the identity of the difference of these types furnishing characters of primary value to the scientist. It does not



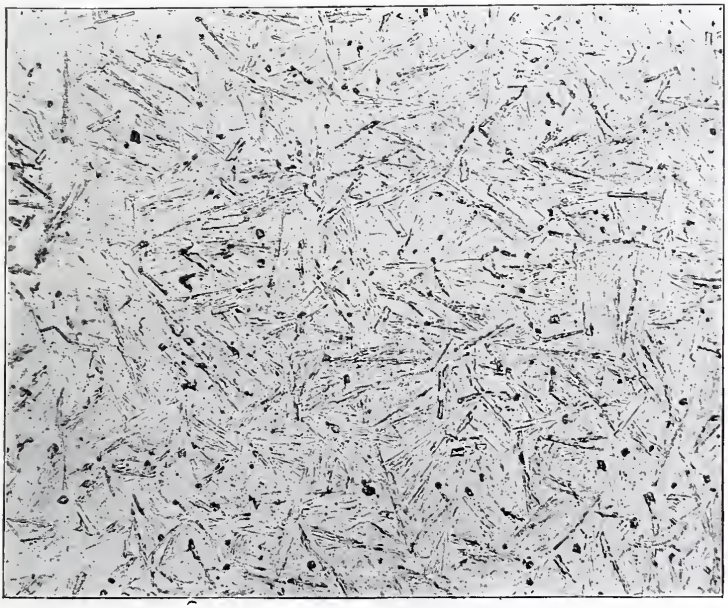
BISULPHATE OF MAGNESIA.

follow, however, that the forms of the crystals shall be constantly the same for each substance. On the contrary the same plan of crystallization may exhibit itself under a great variety of forms, entirely depending, as I have said before, upon the strength of the solution, that is to say, upon the amount of the salt held in suspension by the liquid. And the study of these in such minute crystals are appropriate subjects for observation by the scientist or photographer.

The following is a list of salts (in addition to those which are reproduced for this article) which will give a good class of crystals:

Phthalic Acid A.
Nitrate of Barium.
Chlorate of Potash.
Benzoic Acid A.
Phosphate of Soda.
Alum.
Acetate of Zinc.
Oxalate of Soda.
Chromate of Potash.
Nitrate of Soda.
Microcosmic Salt.
Oxalate of Potash.
Acetate of Copper.
Sulphate of Iron.
Citric Acid.
Nitrate of Uranium.

And many others.



BORAX.

I do not propose to refer *seriatim* to the illustrations which accompany this paper, for they may be said to speak for themselves.

Some may be inclined to question the utility of investigations like these, and to doubt whether any good or practical purposes may be secured by their pursuit. To such I would point out that it is by just such researches in the by-paths of science that great and far-reaching results are frequently attained.

Edison's career is in itself an irrefutable proof of this, and was it not while experimentalizing that Roentgen discovered and demonstrated the wonderful power of the X-rays? Who knows, then, to what the careful study in the way I have endeavored to outline of wonderful variations of crystallization might lead. My object in penning this article has not been so much to present the subject to your readers in a technical or scientific sense as to describe it in a way which may induce the photographic



BY THE OLD QUAY. By REV. A. H. BLAKE.



SUNSHINE AND MIST. By E. ATKINSON.



THE FARM ON THE MARSH. By E. ATKINSON.

student to vary his subject and add to his interest in his work.

If I may be permitted to say so, it will at least certainly afford a sort of semi-scientific photographic diversion which perchance might be a stepping stone to greater things.'

HALF-TONE BLOCKS WITH WOOD-CUT FINISH.

BY ALFRED STIEGLITZ.

THE half-tone process rules the world of illustration to-day. It is due to the extreme quickness and cheapness with which blocks can be turned out that most newspapers, magazines, pamphlets, etc., are filled with reproductions of all kinds of illustration. The Americans are without doubt leaders in this branch of photography, and thanks to their skill and ingenuity, nearly every one who knows how to use a camera is enabled to turn out half-tone plates.

Still the differences in the quality of the plates are very great, these being due to the *finish*. Of late wood-engravers have taken up this branch of the trade, and half-tones are produced with a so-called wood-cut finish.

Certain plates manufactured by this method are very beautiful, containing the strength of a wood-cut, with all the softness of the half-tone. Naturally it takes an expert to turn out such plates, and in certain cases even first-class artists. This increases the price of the blocks, but all those who care for quality are availing themselves of this class of work. Nevertheless a first-class half-tone without this extra finish is preferable to most of the abortions now seen in our cheaper magazines.

A very fine specimen of half-tone engraving with wood-cut finish, together with the cut before treatment, will be found on the next two pages.



A WELSH COTTAGE. BY KARL GREGER.

(Straight Half-tone.)



A WELSH COTTAGE. BY KARL GREGER.

(Half-tone with Woodcut Finish.)

HARNESSING A MICROSCOPE.

BY O. G. MASON.

WHEN we consider the almost boundless field for illustration in the world of the minute, and the profusion of detail found in larger objects, it appears rather strange that so few amateur and professional photographers use microscopical apparatus. The apparent lack of interest in this class of work, may, in a measure, be attributed to misconception of obstacles to be overcome, before any large degree of success is attained, and some may be deterred by reluctance to incur the expense of suitable apparatus; but both of these apparently discouraging features have little more than an imaginary existence for the energetie student who is willing to *work* for success.

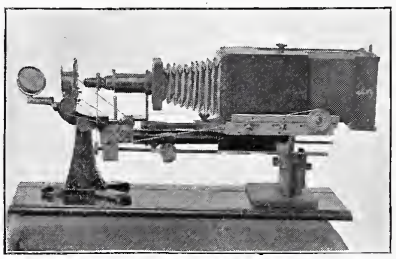


FIG. I

Any person aecustomed to manipulation with the compound microscope, even in some of its simpler forms, may—in these days of dry plates—by the expenditure of a few dollars, or—if handy, with tools, a little time—make such additions to his microscope as will enable him to do much valuable work. If he is a mieroscopist without any knowledge of the manipulation and chemistry of photography, he yet has some of the most important elements of success, namely, the ability to properly light and focus his subject. The necessary caution in handling and timing exposure to light in the instrument

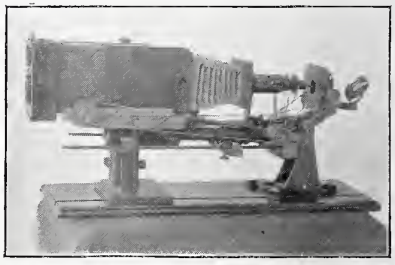


FIG. 2.

is a matter soon learned by experience, and the chemical work of developing and printing may be intrusted to some photographer who will use care in *his* part of the work. The first attempts of the writer in this field of investigation were made with apparatus added to his microscope at a cost of about six dollars. It consisted of a telescoping box of wood and a holder for plates $3\frac{1}{4} \times 2\frac{3}{4}$ (the old $\frac{1}{6}$th size). The ocular end of the microscope body was closely fitted through the front end of this box, which rested on a proper support in a horizontal position, and offered very good facilities for coarse adjustment, while the fine adjustment screw was within reach of the extended arm when seated at the plate holder end of the instrument. Of course, under these conditions the amplification was not great, especially with low power objectives; yet it was quite enough to make the work interesting, and would well answer for lantern slides, which is generally the ultimate use to which such photographic plates are put. As the work by such simple methods increases desire for deeper insight into the mysterious world of wonder which it reveals, more elaborate methods are devised for economizing time and reaching more perfect results. Such has been the prompting influence which led to the construction of the instrument here figured and described.

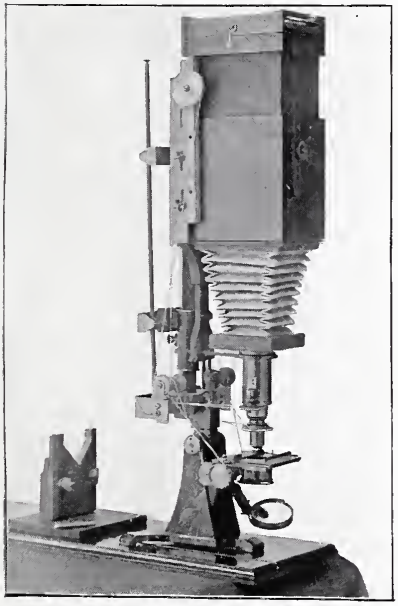


FIG. 3.

In using the microscope with the ordinary length of body or tube—some ten or twelve inches—the field or size

of picture obtainable is often restricted by the marginal rays striking the inside of the ocular end of the tube from which they are reflected, and produce a confused image or foggy picture. To obviate such defect the body of the microscope is made short, and is held in position by a firm arm of brass projecting from the metal sleeve, sliding on the square rod which carries the photographic parts of the instrument. This sleeve is kept in position by a set screw most plainly seen in Fig. 4. The back end of this sleeve is also fastened by a set-screw, one of the bars carrying the bearings for the adjusting rods hereafter mentioned. The back bearing for these rods is attached to the wood sleeve which carries the camera part of the device. This is held in position by a winged thumb-nut seen in Figs. 1 and 2, which clamps it to a sliding tongue held to arm carrying optical or barrel part by hinged and hooked clamp seen in Figs. 3 and 4. The approximate focus is obtained by the telescoping box, which is held in position by a thumb-nut clasping a slotted tongue of brass on top of the box, as seen in Figs. 1, 2, and 3. On the back end of the sliding box are hooked plate holder carriers, extensions, or such other appliances as may be required. To the sides of the bed carrying the camera box are secured adjustable slats, which provide means for tightening the belts passing over the larger pulleys which they carry, as seen in Figs. 1 and 2. These long belts put in action the spool pulleys which carry shorter belts for

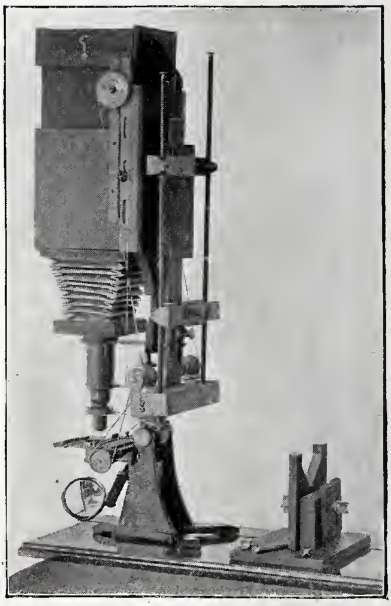


FIG. 4.



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"A TOUCHING CHORD."

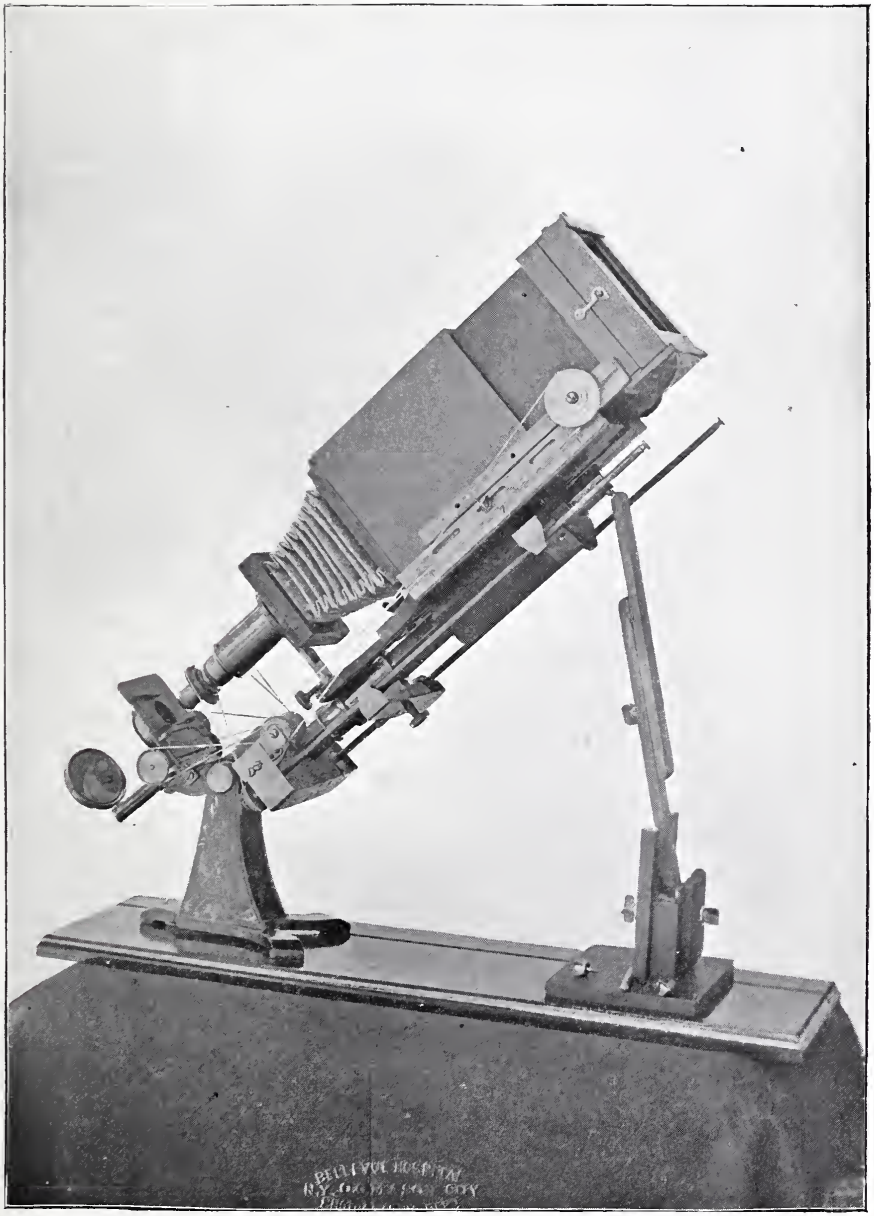


FIG. 5.

moving the mechanical stage across, or up and down the field of the objective, as shown in all the figures. The rod on the right hand side of the instrument carries a pulley for making the fine adjustment, as best shown in Fig. 4.

The rod on the left carries a pulley for the band passing over a grooved ring attached to the collar of the objective for cover-glass adjustment. The iron stand carrying the stage, sub-stage, mirror, etc., is attached to the bar supporting camera-box and other parts by a strong screw worked by a short lever, as seen in Fig. 1. The head of this lever-screw serves another important purpose in preventing injury of objective or cover-class by meeting the head of a long screw passing through the vertical arm whieh supports the optical parts, as shown in Fig. 1. The use of adjustable support for back of camera-box is so plainly shown in the figures as to require no written description. In conclusion, a few words regarding some of the peculiar advantages of this instrument may not here be out of place. First, the mechanical and optical parts are so constructed that any slight vibration will not throw them out of adjustment, as all are firmly attached to one center, which admits of the whole being easily put in horizontal, vertical or angular position, as the work in hand may require. All parts are adjustable for wear, atmospheric changes, and the various classes of work. The operator, seated at the back of the camera, can manipulate the whole instrument with ease and certainty, even to the adjustment for cover-glass, and searching the field for any particular object, or selecting the most suitable for his purpose. The whole apparatus is light and compact. Size of plates used, 3¼ x 4¼. The large Bellevue instrument, on this general plan, carries plates 8 x 10.











SNAP SHOTS
BY
"IGNORAMUS"

SOME LATE EXPERIMENTS WITH DEVELOPERS OF THE AROMATIC SERIES.

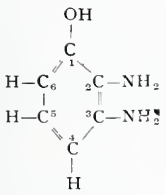
BY A. B. AUBERT.

DR. ANDRESEN has given in Eder's Yahrb. f. photo. 1895, a series of investigations of certain laws formulated by the Brothers Lumière in regard to the relation between the structure of some aromatic compounds and their developing power. Without going into the details of the experiments, some of the most interesting results are given below in tabular form. The first table given has special reference to the developing power of the compounds mentioned when mixed with sulphite of soda, or with an alkali (soda), that is, they indicate when the addition of an alkali is necessary, or whether a neutral solution will act as a developer.

	Orthocompound		Metacompound		Paracompound	
	with sulphite	with soda	with sulphite	with soda	with sulphite	with soda
$C_6H_4{<}^{OH}_{OH}$	does not develop	acts as a strong developer	does not develop	does not develop	does not develop	acts as a strong developer
$C_6H_4{<}^{NH_2}_{NH_2}$	does not develop	acts as a moderately strong developer	does not develop	does not develop	acts as a weak developer	acts as a moderately strong developer
$C_6H_4{<}^{OH}_{NH_2}$	acts as a weak developer	acts as a moderately strong developer	does not develop	does not develop	acts as a moderately strong developer	acts as a strong developer

The following results were obtained in an examination of the developing powers of six isomeric diamidophenols in aqueous solution of sodic sulfite.

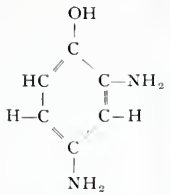
I.



Groups OH and NH_2 in pairs	develops with sulfite
Ortho position (OH)—(NH_2) (1) (2)	weakly
Meta position (OH) (NH_2) (1) (3)	not at all
Ortho position (NH_2) (NH_2) (2) (3)	not at all

The compound develops weakly in sulphite solution.

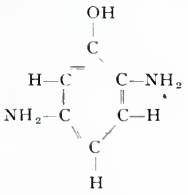
II.



Groups OH and NH_2 in pairs	develops with sulfite
Ortho position (OH) (NH_2) (1) (2)	weakly
Para position (OH) (NH_2) (1) (4)	fairly well
Meta position (NH_2) (NH_2) (2) (4)	not at all

The compound develops powerfully in sulphite solution.

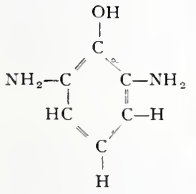
III.



Groups OH and NH_2 in pairs	develops with sulfite
Ortho position (OH) (NH_2) (1) (2)	weakly
Para position (NH_2) (NH_2) (2) (5)	weakly
Meta position (OH) (NH_2) (1) (5)	not at all

The compound develops fairly well in sulfite solution.

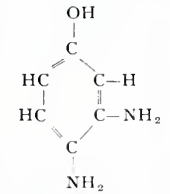
IV.



Groups OH and NH_2 in pairs	develops with sulfite
Ortho position (OH) (NH_2) (1) (2)	weakly
Ortho position (OH) (NH_2) (1) (6)	weakly
Meta position (NH_2) (NH_2) (2) (6)	not at all

The compound develops in sulfite quite strongly.

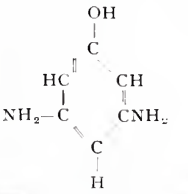
V.



Groups OH and NH_2 in pairs	develops with sulfite
Meta position (OH) (NH_2) (1) (3)	not at all
Para position (OH) (NH_2) (1) (4)	fairly well
Ortho position (NH_2) (NH_2) (3) (4)	not at all

The compound develop fairly well in sulfite solution.

VI.



Groups OH and NH_2 in pairs	develops with sulfite
Meta position (OH) (NH_2) (1) (3)	not at all
Meta position (OH) (NH_2) (1) (5)	not at all
Meta position (NH_2) (NH_2) (3) (5)	not at all

The compound does not develop in sulfite solution.



"STUDY OF FISHERFOLK." By MISS K. G. SPINK.



TWILIGHT ON THE COVE. By HENRY TROTH.



THE COTTAGE BY THE SEA. By J. M. C. GROVE



"IN THE EVENING SHE WENT HOME." By JESSE POUNDSTONE.



"THE COMING SHOWER." By JESSE POUNDSTONE.



IN THE HIGHLANDS. By W. DAWES



EMMA EAMES.

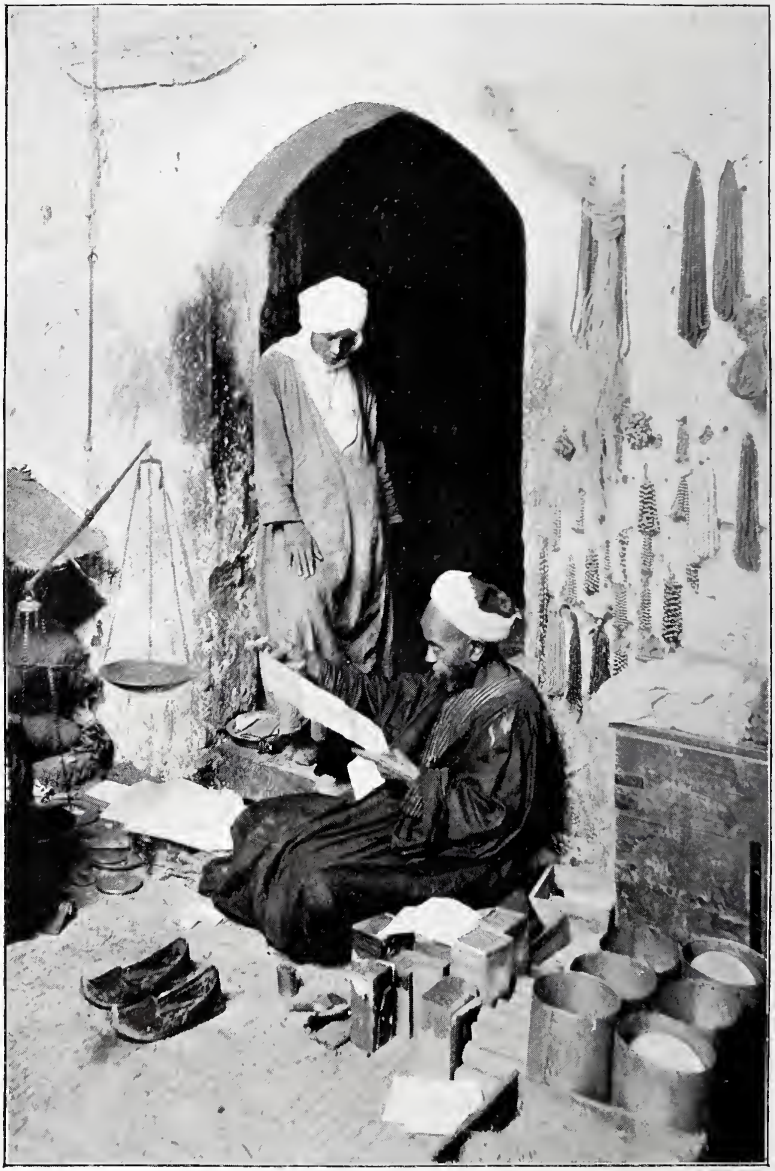
BY J. C. STRAUSS.



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DEVOTION.

BY DEXTER THURBER.



A MATTER OF BUSINESS.

BY E. R. ASHTON.

A REVIEW.



THE WOOD-ENGRAVER. By R. DULK.

THE year that is passed has been an eventful one in a way. The photographer will look back to it as one of failures and hard struggles. Let us hope for better times in the year that will soon be born.

With the exception of Prof. Roentgen's discovery little of importance has to be chronicled, and even this has but little connection with our art, notwithstanding the fact that it has been popularly termed "The New Photography." One or two articles dealing with the subject will be found in this volume, so that it is not necessary for us to enter into any detailed description of the process here.

Various methods have been advocated for the accurate determination of the speed of plates, but it appears practically impossible to establish any reliable photometric standard.

Acetylene gas has been strongly recommended as a new illuminant. It is stated that the light given is remarkably rich in the actinic rays, and if all that is said for it is correct it should prove very valuable to photographers for lantern, microscopic, and even studio work. An article on the subject will be found elsewhere.

Practically nothing novel in the way of apparatus has been placed on the market, possibly for the reason that manufacturers have been deterred by the hard times from investing money in new ideas. The market has been flooded with a number of pocket cameras, some of them of quite ingenious construction, but it is doubtful if they benefit the art in any way. The purchasers soon get tired of their new toy, and come to the conclusion that photography is a delusion and a snare.

Various new substances have been recommended as developing agents. It is stated that Hæmatoxylin in presence of sodium carbonate is a powerful developer. Liesegang discovered that when solutions of sodium sulphite and potassium nitrate are mixed with zinc dust and slightly acidified with citric acid diamide is formed which may be used as a developing agent. It has not been proved, however, that any of these substances have any advantage over the developers now in use.

Collodion and gelatine papers still hold their own for positive printing, although many photographers are now returning to albumen. This is possibly owing to the fact that many of the prints made on these papers when first manufactured are rapidly fading. We are convinced, however, that this is less likely to happen with the improved papers as now made. Platinotype and carbon papers are gradually gaining ground with those aiming for artistic effects. It is curious to note how slow the photographers of this country are to recognize the superior quality of these printing methods.

Much has been written during the last few years upon the subject of orthochromatic photography. Disputes have arisen as to the value of color-sensitized plates without the use of a color screen or ray filter. Stephen H. Horgan has an interesting article on the subject in the October issue of *The Photographic Times*, illustrated with reproductions showing orthochromatic values of all the principal plates at present on the market.

Ives recommends the use of a mixture of napthol yellow and chrysoidin for the ray filter.



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Photo. Engraving Co., N. Y.

FAIRY TALES.

With regard to color photography, the ideal process still remains but a dream to the photographer. Lippmann has made several improvements upon his orginal process, as have also Messrs. Lumiere Bros., and M. De Saint Florent, but the method is still very defective, and utterly useless for practical purposes.

A company has been formed in this country to work the Joly process of color printing by means of photography. The negative is made through a screen composed of fine red, blue and yellow lines, and from this three printing plates are made. Detailed descriptions of the process have been given in all the magazines. A patent for a similar process to Joly's was taken out about the same time, by J. W. McDonough. Instead of ruled lines he makes a screen by dusting over the plate particles of colored glass or transparent pigments. It is very doubtful if either of these processes will have any practical value in the future. The idea of the process is of course to do away with the necessity of making three separate negatives. The three-color process as worked to-day is making rapid strides, although the results are still very uneven and uncertain.

With regard to the half-tone process very beautiful work is now turned out in this country. American process workers are holding their own in leading the world. Many experiments have been made in altering the shape of the diaphragm to obtain the best kind of dot.

With regard to photographic optics many improved forms of lenses have been devised.

The Gundlach Optical Co., of Rochester, have placed on the market the Turner-Reich anastigmat lens, with an aperture of *f*/7.5, and claim for it an absolutely flat field. Messrs. Taylor & Hobson are manufacturing the Cooke lens, constructed according to the patent of Mr. Dennis Taylor. It is claimed for these lenses that they have a maximum aperture of *f*/6.5. Voightlander's collinear lens is also a remarkable one for certain kinds of work.

Messrs. Dallmeyer have introduced a lens according to the ideas expressed by M. Bergheim. It is termed the Dallmeyer-Bergheim lens. It consists of a single meniscus posi-



Pennsylvania Electro Photo. Type Engraving Co.

A GOOD STORY.

BY C. PUYO.

tive lens, with a diaphragm in front and a single large negative lens behind. It is claimed that the negative lens entirely eradicates pinhole distortion. Several pictures taken with this lens by Mr. Bergheim attracted considerable attention at recent exhibitions. Messrs. Dallmeyer have also introduced a new telephoto lens, and a telephoto attachment. Goerz has placed a new lens upon the market. It possesses a high illuminating power, free from astigmatism.

Artistic photography is improving in this country. Many photographers are at last beginning to realize the fact that the camera is capable of producing artistic results if properly handled. Americans have been quite successful in gaining awards at the exhibitions abroad, and we are beginning to hope that the day is not far distant now when this country will be able to have a Salon of its own, conducted on proper lines, and at which will be exhibited some artistic work, at least equal to that shown abroad.



FINIS. By J. W. DUNN.



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"IDLE MOMENTS."

By the CARBON STUDIO.

STANDARD FORMULAE
AND
USEFUL RECIPES.

THE WET COLLODION PROCESS.

1.—NEGATIVE COLLODION.

Ether	¼ fluid ounce
Absolute alcohol	½ fluid ounce
Pyroxyline	5 gr.
Iodide of ammonium	5 gr.
Bromide of cadmium	2 gr.

2.—FERROTYPE COLLODION (ESTABROOKE'S).

Iodide of ammonium	30 gr.
Iodide of sodium	10 gr.
Iodide of cadmium	20 gr.
Bromide of cadmium	20 gr.
Ether and alcohol (of each)	5 ounces
Pyroxyline, sufficient quantity, say	25 gr.

3.—COLLODION FOR THE REPRODUCTION OF LINE WORK (VOLKMER'S).

Plain Collodion.		*Sensitizer.*	
Ether	700 C.c.	Chloride of calcium	1.6 Gm.
Alcohol	490 C.c.	Iodide of ammonium	4.7 Gm.
Pyroxyline	16 Gm.	Iodide of cadmium	7.8 Gm.
		Absolute alcohol	123 C.c.

After being perfectly dissolved, mix.

4.—ENAMEL COLLODION.

Alcohol (.82)	48 ounces
Ether (.72)	84 ounces
Pyroxyline	1 ounce
Castor oil	10 minims

5.—SILVER BATH FOR WET-PLATES.

Nitrate of silver	1 ounce
Distilled water	10 ounces

Iodize and acidulate with nitric acid.

6.—SILVER BATH FOR FERROTYPES (ESTABROOKE'S).

Nitrate of silver	4 ounces
Water	64 ounces
Iodide potassium	2 gr.

Dissolve, sun for three or four hours, filter and acidulate.

7.—DEVELOPER FOR FERROTYPES, BY E. P. GRISHOLD.

Protosulphate of iron and ammonia	4 ounces
Water	64 ounces
Acetic acid, 1.048 (U. S. Ph.)	4 ounces
Yellow rock candy	½ ounce

8.—DEVELOPER FOR WET-PLATES.

Sulphate of iron and ammonia	1 ounce
Acetic acid, 1.048 (U. S. Ph.)	1½ ounces
Water	16 ounces

9.—DEVELOPER FOR HARD NEGATIVES (LINE WORK) WET-PLATES.

Protosulphate of iron	5 Gm.
Water	100 C.c.
Tartaric acid	1 Gm.

10.—Developer for Wet-Plates (Very Intense).

Protosulphate of iron	36 Gm.
Sulphate of copper	12 Gm.
Water	1000 C.c.
Glacial acetic acid, 85 per cent	50 C.c.
Alcohol	40 C.c.

11.—Intensifier for Wet-Plates.

Saturated solution of protosulphate of iron	20 C.c.
Acetic acid, 1.048 (U. S. Ph.)	10 C.c.
Citric acid	5 Gm.
Water	200 Gm.

And silver solution to suit.

12.—Intensifier for Wet-Plates.

Pyrogallic acid	1 Gm.
Citric acid	3 Gm.
Water	80 C.c.

And silver solution to suit.

13.—Intensifier for Line Work, Wet-Plates.

A.—Bromide of potassium	½ ounce
Water	4 ounces
B.—Sulphate of copper	½ ounce
Water	4 ounces

Mix equal parts of A and B, and pour on the film. When perfectly whitened, blacken with solution of nitrate of silver, 30 grains to the ounce.

For greater intensity, use hydrosulphate of ammonia solution, 1 part in 4 parts of water, after the bromide of copper, and thorough washing.

14.—Intensifier for Wet-Plates.

Red prussiate of potash	2 drachms
Nitrate of lead	3 drachms
Water	12 ounces

Immerse the fixed negative till thoroughly whitened; wash, and flood with solution of hydrosulphate of ammonia.

15.—To Strip Collodion Negatives.

The best way to do this is to coat the negative, when dry, with a solution of pure rubber in benzole, and afterwards with leather collodion. When perfectly dry, the edges of the negatives may be cut in, and the plate immersed in a diluted acetic acid solution 1:10. After a short time the film loosens, and may easily be detached from the plate, and turned.

16.—To Rectify a Negative Silver Bath,

Dissolve 1 part of permanganate of potassium in 100 parts of water and add drop by drop so much of this solution to the bath impregnated with organic matter, till, after vigorously shaking, a slight pinkish color remains.

Sun for several hours, filter and test for neutrality. Acidify with nitric acid.

DRY COLLODION PROCESSES.

17.—Collodio-Bromide Emulsion.

Ether, sp. g. 0.720	5 fluid ounces
Alcohol, sp. g. 0.820	3 fluid ounces
Pyroxyline	50 gr.
Bromide of cadmium and ammonium	80 gr.
(or bromide of zinc	76 gr.)

Sensitize by adding to each ounce 15 grains of nitrate of silver, dissolved in 1 drachm of boiling alcohol mixed with a few drops of water. This is suitable for slow landscape work or transparencies.

GELATINE DRY-PLATE PROCESSES.

18.—W. K. Burton's Gelatine Emulsion.

A.—Bromide of ammonium.....260 gr.
Iodide of potassium.....20 gr.
Gelatine (Nelson, No. 1).....80 gr.
Distilled water.....10 ounces

B.—Silver nitrate.....200 gr.

C.—Silver nitrate.....200 gr.
Distilled water.....1 ounce

Converted to ammonio-nitrate.

D.—Gelatine, hard (dry).....600 gr.

For detailed directions for making the emulsion, see *Photographic Times*, Vol. XVII., page 285.

19.—Henderson's Gelatine Emulsion by Ammonia Method.

Dissolve

Bromide of ammonium.....308 gr.
Gelatine.....50 gr.

Previously swelled

In distilled water.....8½ ounces

When cold, add

Water.....1¾ ounces
Alcohol.....1¾ ounces
Stronger ammonia (0.900).....½ ounce

Next dissolve by heat

Nitrate of silver.....462 gr.
In distilled water.....3¾ ounces

and add gradually to the gelatine solution. Ripening for twenty-four hours gives sensitiveness to the emulsion. Add, finally, 220 grains of swelled gelatine.

20.—Dr. J. M. Eder's Gelatine Emulsion with Ammonio-Nitrate of Silver.

In distilled water, 10 ounces, dissolve bromide of potassium, 370 grains; add gelatine, 617 grains, previously swelled in water. In distilled water, 10 ounces, dissolve nitrate of silver, 462 grains.

To this solution, cold, add stronger ammonia, drop by drop, until the precipitate first formed is redissolved. Add this gradually to the first solution, and place in a water bath at a temperature of 105 deg. Fahr., for 30 to 45 minutes. Then remove the source of heat, and allow the emulsion to cool down gradually to about 75 deg. Fahr., then pour out to set, and proceed as usual.

21.—Gelatino-Bromo-Chloride Emulsion.

Ammonium bromide.....65 grains
Ammonium chloride.....5 grains
Gelatine.....10 grains
Silver nitrate.....120 grains
Nitric acid.....½ minim
Water.....4½ ounces

DEVELOPMENT OF GELATINE EMULSION PLATES.

22.—CARBUTT'S PYRO DEVELOPER.

No. 1. *Pyro Stock Solution.*

300 C.c.	Distilled or ice water	10 ounces
1 Gm.	Oxalic acid	15 gr.
2 Gm.	Bromide potassium	30 gr.

Then add Schering's pyro, 1 ounce (30 grammes), and water to make 16 fluid ounces (480 C.c.).

No. 2. *Stock Soda Solution.*

300 C.c.	Water	10 ounces
60 Gm.	Soda sulphite crystal	2 ounces
60 Gm.	Soda Carb. Crys. (or dry gran. 1 oz)	2 ounces
30 Gm.	Potash Carbonate	1 ounce

Dissolve, and add water to make measure 16 fluid ounces (480 C.c.).

No. 3. *Bromide Solution.*

14 Gm.	Bromide of sodium or potassium	½ ounce
150 C.c.	Water	5 ounces

Pyro Developer.—Dilute 2 ounces of stock No. 2 with 7 ounces of water for cold weather, and 10 to 12 of water in summer. To 3 ounces of dilute No. 2 add 1½ to 2½ drachms (6 to 10 C.c.) of No. 1. The more pyro the denser the negative, and *vice versa.* No yellowing or fogging need be apprehended if our directions are followed. Development should be continued until the image seems almost buried, then wash and place in fixing bath.

For instantaneous exposures, take for a 5 x 8 or 6½ x 8½ plate 3 ounces of dilute No. 2. Lay the plate to soak in this, and cover pan. Put 2 drachms of No. 1 into the graduate, and 3 drops of bromide solution. Pour the soda solution off of the plate into the pyro and back over the plate; let development proceed, and examine occasionally. Keep solution in gentle motion over the plate. A *very* short exposure may take ten minutes to fully develop. If the image is not fully brought out this time, add to developer in pan three times its bulk of water, and let plate lie in it covered over half an hour or more if necessary, until full development is attained; then wash, and proceed as directed under head of developer

23.—EIKONOGEN AND HYDROCHINON DEVELOPER (FOR CARBUTT'S ORTHOCHROMATIC PLATES, "CELLULOID" FILMS AND TRANSPARENCIES).

Metric Weight.	A.	Avoirdupois Weight.
600 C.c.	Distilled water	20 ounces
120 Gm.	Sulphite of soda crystals	4 ounces
22 Gm.	Eikonogen	330 gr.
10½ Gm.	Hydrochinon	160 gr.
960 C.c	Water to make up to	32 ounces

Metric Weight.	B.	Avoirdupois Weight.
600 C.c.	Distilled water.	20 ounces
60 Gm.	Carbonate of Potash	2 ounces
60 Gm.	Carbonate soda crystals	2 ounces
960 C.c.	Water to make up to	32 ounces

Developer.—For instantaneous exposures, take (30 C.c.) 1 ounce A, (30 C.c.) 1 ounce B, (120 C.c.) 4 ounces water; for portraits, take (30 C.c.) 1 ounce A, (30 C.c.) 1 ounce B, (150 C c.) 5 ounces water; for landscapes, full exposures, sens. 20-27, take (30 C.c.) 1 ounce A, (15 C.c.) ½ ounce B, (90 C.c.) 3 ounces water; for landscapes, full exposures, sens. 16-20, take

(30 C.c.) 1 ounce A, (25 C.c.) ¾ ounce B, (120 C.c.) 4 ounces water; for lantern slides, full exposures, take (30 C.c.) 1 ounce A, (25 C.c.) ¾ ounce B, (120 C.c.) 4 ounces water, and 2 to 6 drops Restrainer D to each ounce of developer.

NOTE.—More of A will increase density, more of B will increase detail and softness. Temperature of developer should not vary much below 65 degs. nor above 75 degs. The after-treatment is the same as with any other developer.

24.—CARBUTT'S NEW ACID FIXING AND CLEARING BATH.

4 C.c.	Sulphuric acid	1 drachm
480 Gm.	Hyposulphite of soda	16 ounces
60 Gm.	Sulphite of soda	2 ounces
30 Gm.	*Chrome alum	1 ounce
1920 C.c.	Warm water	64 ounces

Dissolve the hyposulphite of soda in 48 ounces (1440 C.c.) of water, the sulphite of soda in 6 ounces (180 C.c.) of water, mix the sulphuric acid with 2 ounces (60 C.c.) of water, and pour slowly into the sulphite soda solution, and add to the hyposulphite; then dissolve the chrome alum in 8 ounces (240 C.c.) of water and add to the bulk of solution, and the bath is ready. This fixing bath will not discolor until after long usage, and both clears up the shadows of the negative and hardens the film at the same time.

After negative is cleared of all appearance of silver bromide, wash in running water for not less than half an hour to free from any trace of hypo solution. Swab the surface with wad of wet cotton, rinse, and place in rack to dry spontaneously.

25.—CARBUTT'S CLEARING SOLUTION TO REMOVE YELLOW STAIN CAUSED BY DEVELOPER.

600 C.c.	Water	20 ounces
90 Gm.	Sulphate of iron	3 ounces
30 C.c.	Sulphuric acid	1 ounce
30 C.c.	Alum	1 ounce

If, after developing and fixing your negative, it is found to be stained yellow from the pyro or hydrochinon developer, first wash well to remove all hyposulphite, then immerse in above solution until the stain is removed; again wash well, and dry.

N. B.—It will improve lantern slides to immerse them for a few minutes in the clearing solution after being well freed from hyposulphite.

26.—CARBUTT'S INTENSIFYING SOLUTION.

Intensification.—With correct exposure and development, intensification need never be resorted to. The following formula is, however, very effective, and the most permanent of all methods:

No. 1.

16 Gm.	Bichlor. mercury	240 gr.
16 Gm.	Chloride ammonia	240 gr.
600 C.c.	Distilled water	20 ounces

No. 2.

16 Gm.	Chloride ammonia	240 gr.
600 C.c.	Water	20 ounces

* N. B.—During cold weather use only half the quantity of chrome alum in above.

No. 3.—*Cyanide-Silver Solution.*

180 C.c.	Distilled water	6 ounces
4 Gm.	Cyanide potass., C. P.	60 gr.
60 C c.	Distilled water	2 ounces
4 Gm.	Nitrate of silver	60 gr.

Pour the silver into the cyanide solution while stirring, and mark bottle *poison.*

Let the plate to be intensified wash for at least half an hour, then lay in a 5 per cent. solution of alum for ten minutes, and again wash thoroughly; this is to insure the perfect elimination of the hypo. The least trace of yellowness after intensifying shows that the washing was not sufficient.

Flow sufficient of No. 1 over the negative to cover it, and allow to either partially or entirely whiten; *the longer it is allowed to act*, the *more intense* will be the result; pour off into the sink, rinse, and flow over No. 2, and allow to act one minute; wash off, and pour over or immerse in No. 3 until changed entirely to a dark brown or black. No. 3 can be returned to its bottle, but Nos. 1 and 2 had better be thrown away. Wash thorougly and dry.

27.—WUESTNER'S DEVELOPERS FOR NEW EAGLE LIGHTNING, NEW ORTHOCHROMATIC AND IMPERIAL NON-HALATION PLATES.

Developing Formula.—These plates can be successfully worked with any good developer. For producing the finest negatives, with shortest possible exposure, we recommend the following "sal soda" developer:

No. 1. *Pyro Stock Solution.*

Water	84 ounces
Sulphite soda crystals	1 pound
Pyrogallic acid	2 ounces
Sulphuric acid, C. P	10 drops

No. 2. *Soda Stock Solution.*

Water	84 ounces
Sal soda (crystals)	8 ounces

Developer.—Take 2 ounces of No. 1, and 2 ounces of No. 2, and add 8 ounces of water.

This developer may be used repeatedly as long as it remains clear, but will work slower and with more intensity when old. Therefore the fresh developer is best for short exposures, and the old is better if the plate has been full timed. In using the sal soda developer, *it is very important, to carry the development far enough, until the lights have sufficient intensity when examining the plate by transmitted light.*

Over-exposure is corrected by adding to each ounce of developer from 2 to 4 drops of the following solution: Bromide of ammonium, 1 ounce to 10 ounces of water; or by putting the plate into a weak solution of bromide of ammonium (1 to 50 water), before the development has proceeded too far, and then returning it to the developer, to gain sufficient intensity.

If under-exposure is noticed, take the plate out of developer, and, without draining, put into "soda solution"; sufficient developer will remain in the film to develop the shadows, the lights being prevented from gaining too much density in this way.

28.—WUESTNER'S EIKONOGEN DEVELOPER FOR PORTRAITS AND LANDSCAPES.

No. 1.

2400 C.c.	Distilled or ice water	80 ounces
115 Gm.	Sulphite of soda (crystals)	3½ ounces
4 Gm.	Oxalic acid	1 drachm
75 Gm.	Eikonogen	2½ ounces
15 Gm.	Yellow prussiate of potash	½ ounce

No. 2.

600 C.c.	Distilled or ice water	20 ounces
60 Gm.	Carbonate of potash	2 ounces

Developer.—Take 4 ounces of No. 1 and ½ ounce of No. 2.

For instantaneous exposures, we recommend the following eikonogen developer:

Dissolve in

300 C.c.	Distilled or ice water	10 ounces
20 Gm.	Sulphite of soda crystals	⅔ ounce
10 Gm.	Carbonate of potash	⅓ ounce

And then add

10 Gm.	Eikonogen	⅓ ounce

Fixing Bath.

Water	100 parts
Sulphite soda (crystals)	5 parts
Sulphuric acid, C. P.	1 part

And add

Hyposulphite of soda	20 parts

This fixing bath cannot be excelled; you will always get a clear and brilliant negative, no yellow stains, a good printing color, and the plate will fix in considerable less time.

After fixing, place the negative in a dish containing a 10 per cent. chrome alum solution; let it remain a few minutes to harden the film, then wash thoroughly.

In tropical climates, we recommend putting the plates in the alum solution before fixing.

29.—Wuestner's Amidol Developer.

1000 C.c.	Water	34 ounces
60 Gm.	Sulphite of soda (crystals)	2 ounces
1 Gm.	Bromide of ammonium	15 gr.

Dissolve, and add 4 to 6 grains (from 1 to 1½ drachms) amidol just before using.

For instantaneous exposures, take double the quantity of sulphite of soda (crystals) 120 grammes (4 ounces).

It is advisable to put this developer up in small quantities.

30.—Direction for Working the Cramer Plate.

Eikonogen Developer.

Metric Weights and Measures.	No. 1.	Engl. Measures, Troy Weight.
1200 C.c.	Distilled water Hydrometer test 15.	40 ounces
60 Gm.	Sulphite of sodium crystals	2 ounces
30 Gm.	Eikonogen	1 ounce

Boil for a few minutes. After cooling, pour into a bottle and keep it well stoppered.

No. 2.

300 C.c.	Water	10 ounces
30 Gm.	Carbonate of potassium	1 ounce

For Use.

90 C.c.	Solution No. 1	3 ounces
30 C.c.	Solution No. 2	1 ounce

In hot weather, dilute with an equal quantity of cold water. This developer can be used repeatedly by occasionally adding more of Solution No. 1 and 2.

To obtain thin negatives, full of detail, such as are required for printing on Aristo Paper, use the developer more diluted.

For negatives of greater density, add to solution No. 1:

4 Gm.	Hydrochinon	1 drachm

PYRO DEVELOPER.

Alkaline Solution.

1800 C.c.	Water	60 ounces
150 Gm.	Carbonate of sodium crystals (sal soda)	5 ounces
300 Gm.	Sulphite of sodium crystals	10 ounces

A smaller quantity of sulphite will produce a warmer tone, a larger quantity a gray or bluish-black tone.

The alkaline solution must be kept in well-stoppered bottles.

If the negatives show yellow stain, make a fresh solution, or try another lot of sulphite of sodium.

Pyro Solution.

180 C.c.	Distilled or pure ice water	6 ounces
1 C.c.	Sulphuric acid	15 minims
4 Gm.	Sulphite of sodium crystals	1 drachm
30 Gm.	Pyrogallic acid	1 ounce

All pyro solutions work best while fresh.

8 grains dry pyro may be substituted for 1 drachm of this solution.

Mix in the following proportions:

10 C.c.	Pyro solution	1 drachm
80 C.c.	Alkaline solution	1 ounce
160 C.c.	Tepid water (for winter use)	2 ounces
	or,	
240 to 400 C.c.	Cold water (for summer use)	3 to 5 ounces

Fixing Bath.—The negatives may be fixed in a plain hypo bath, 1 part hyposulphite of soda to 4 parts of water; but the following bath is especially recommended.

Prepare two solutions.

No. 1.

1 kilo	Hyposulphite of soda	32 ounces
3 liter	Water	3 quarts

No. 2.

1 liter	Water	1 quart
15 C.c.	Sulphuric acid	½ ounce
120 Gm.	Sulphite of sodium crystals	4 ounces
90 Gm.	Chrome alum	3 ounces

After the ingredients are dissolved, pour No. 2 solution into No. 1.

During the cold season, one-half the quantity of No. 2 is sufficient.

Cramer's Isochromatic Plates are developed and fixed with the same solutions.

31.—POTASH DEVELOPER FOR "HARVARD" DRY-PLATES.

A.—	Distilled water	12 ounces
	Sulphite of soda (crystals)	2 ounces
	Citric acid	60 gr.
	Bromide of ammonium	25 gr.
	Phrogallic acid	1 ounce

Dissolve separately, mix in order named and filter.

B.—	Distilled water	12 ounces
	Sulphite of soda (crystals)	2 ounces
	Carbonate of potash	4 ounces

Dissolve separately, mix and filter.

The stock solutions must be kept in well stoppered bottles. The pyro stock solution will remain clear and in good order for about a month. It should not be used after it has turned dark and muddy from age.

To develop, mix A, 1 drachm; B, 1 drachm; water, 2 ounces. For detail, add more water; for contrast, more A; for density, more of each, A and B. For instantaneous or short exposures, use double the quantity of water (4 ounces) to begin with; pour off when about half developed, and finish with developer, full strength.

After development, and before fixing, it is well to flow the negative with a saturate solution of alum. Rinse, and fix in the following solution:

Hyposulphite of soda..... 1 pound
Water..... 2 quarts

Many prefer to add alum to the fixing solution (about 1 ounce to the above), to which there is no serious objection, provided, always, it is filtered occasionally.

THE "SEED" PLATE.

32.—PYRO DEVELOPER.

No. 1.

Pyrogallic acid..... 1 ounce
Sulphite of soda (crystals)..... 4 ounces
Water, distilled or good well water..... 16 ounces

No. 2.

Sal soda..... 4 ounces
Water..... 16 ounces

To develop, take

No. 1..... 1 ounce
No. 2..... 1 ounce
Water..... 8 ounces

In warm weather, use more water; in cold weather, less.

Where Aristo Paper is used, the negative must be much thinner and fuller of detail than is required for albumen paper; therefore, take

No. 1..... 1 ounce
No. 2..... 1½ ounces
Water..... 10 ounces

33.—PYRO DEVELOPER BY USE OF HYDROMETER.

Make stock solution of sulphite of soda to test 60 with hydrometer; allow to settle perfectly clear, then take

Sulphite of soda solution..... 16 ounces
Pyro..... 1 ounce
Sulphuric acid..... 10 drops
(Or oxalic acid, 10 gr.)

No. 2.

Sal soda solution, hydrometer test 40.

To develop, take

Water..... 8 ounces
No. 1..... 1 ounce
No. 2..... 1 ounce

In warm weather, use more water; in cold weather, less.

Where Aristo Paper is used, the negative must be much thinner and fuller of detail than is required for albumen paper; therefore, take

No. 1..... 1 ounce
No. 2..... 1½ ounces
Water..... 10 ounces

34.—EIKONOGEN DEVELOPER—NO. I.

No. 1.

Sulphite of soda (crystals)..... 3 ounces
Hot water..... 45 ounces

Thoroughly dissolve, then add

Eikonogen..... 1 ounce

No. 2.

Sal soda..... 4 ounces
(Or carb. of potassium, 1¼ ounces.)
Water..... 15 ounces

To develop, take of

No. 1..... 3 ounces
No. 2..... 1 ounce

Fixing Bath.

Alum	¼ ounce
Hyposulphite of soda	5 ounces
Water	16 ounces

35.—EIKONOGEN DEVELOPER. (In one solution, for instantaneous work.)

Eikonogen	120 grains
Crystallized sulphite of sodium	1½ ounces

Dissolve in 8 ounces of hot water and add carbonate of potassium 120 grains.

For use, dilute with an equal bulk of water, and add a few drops of a 10 per cent. solution of bromide of potassium.

36.—PARA-AMIDOPHENOL DEVELOPER.

Para-amidophenol hydrochlorate	150 gr.
Sulphite sodium in crystals (Andresen's)	1½ ounces
Potassium carbonate	1½ drachms
Water	32 ounces

May be diluted in the proportion of from 1:8 to 1:12.

37.—RODINAL.

Metabisulphite of potassium	30 Gm.
Para-amidophenol hydrochlorate	10 Gm.
Potassium hydrate	To neutralization
Water	100 Gm.

This developer permits to be diluted in the proportion of 1:40.

38.—METOL DEVELOPER (HAUFF).

Solution A.

Water	100 parts
Metol	1 part
Soda sulphite	10 parts

Solution B.

Water	100 parts
Carbonate potash (or substitute)	10 parts
Crystallized carbonate soda	20 parts

For use, three parts A to one of B, with 40 minims of bromide of potassium solution (1 : 10).

39.—METOL DEVELOPER (ANDRESEN).

One Solution.

Water	1 quart
Metol	¾ ounce
Sulphite of soda	7 ounces
Carbonate of potash	3½ ounces
Bromide of potassium	$\frac{1}{10}$ ounce

Two Solution.

A.—Water	1 quart
Metol	¾ ounce
Sulphite of soda	7 ounces
B.—Water	3 quarts
Carbonate of soda	7 ounces

Of these, one part of A is mixed with three parts of water for use, bromide of potassium being added as required for the prevention of fogging.

40.—AMIDOL DEVELOPER.

Dissolve 10 ounces of neutral sodium sulphite in crystals (Andresen's) in 50 ounces of distilled water, and add 1 ounce of amidol. Dissolve, filter quickly, and fill up in small bottles.

For use, dilute with from 2 to 4 volumes of water.

Do not spare bromide of potassium.

41.—Dr. Stolze's Amidol Developer.

A.—Distilled water 100 Gm.
Potassium metabisulphite 25 Gm.
Amidol (Andresen's) 5 Gm.

B.—Distilled water 100 Gm.
Potassium bicarbonate 20 Gm.

To 100 C.c. of water add 10 C.c. of A, and of B from 5 to 50 C.c., according to time of exposure. For normal exposures, 20 C.c. are sufficient.

Do not apply the solution till effervescence has ceased.

42.—Crystallos.

Sodium sulphite cryst 8 ounces
Ferrocyanide potassium 2½ ounces
Hydrochinon 1½ ounces
Caustic potash solution (75 per cent) 2 ounces
Distilled water 28 ounces

Dissolve the first three substances in 20 ounces of water, then add the caustic potash solution, finally the rest of the water. The Paris crystallos is tinted red with aniline dye, which, however, has no influence upon its action.

Dilute the solution with from 1 to 5 and 8 volumes of water.

43.—Glycin Developer.

Sodium sulphite 40 grains
Glycin 20 grains
Potassium carbonate 80 grains
Water 4 ounces

44.—Potash Developer for Gelatine Dry-Plates (Dr. Stolze's).

Modified by Dr. Eder.

A.—Carbonate of potassium 90 Gm.
Sulphite of sodium, cryst 25 Gm.
Water 200 C.c.

B.—Water 100 C.c.
Sulphite of sodium, cryst 25 Gm.
Pyrogallol 12 Gm.

Mix 40 minims of A with 50 minims of B and 100 C.c. of water.

Bromide of potassium should be used only in minimal quantities, 1 to 3 minims (of a 10 per cent. solution); with more, the general sensitiveness is much reduced.

An alum bath mixed with an equal volume of saturated sulphate of iron solution increases the density, and gives the plate a good printing quality.

45.—Soda Developer in One Solution for Gelatine Dry-Plates (Eder's Formula).

Crystallized sulphite of sodium 5 drachms
Carbonate of sodium 2½ drachms

Dissolve in 2 ounces of boiled distilled water, and, after having cooled down, add 46 grains of pyro. Keep in well-stoppered bottles, and for use dilute with five times its bulk of water.

46.—Ferrous-Oxalate Developer for Gelatine Dry-Plates (Dr. Eder's).

A.—Neutral oxalate potassium 200 Gm.
Distilled water 800 C.c.

Acidulate with oxalic acid.

B.—Protosulphate of iron, cryst 100 Gm.
Distilled water 300 C.c.
Sulphuric acid 5 minims

C.—Bromide of potassium 10 Gm.
Distilled water 100 C.c.
D.—Hyposulphite of sodium 2 Gm.
Distilled water 200 C.c.

Mix immediately before use 3 volumes of A with 1 volume of B, and develop. Restrain with a few drops of C.

For over-exposure, take less of the iron solution and add gradually in small portions, as required. To give the negative body, use C.

To make soft negatives with fine detail, take of

A 250 C.c.
B 50 C.c.
C 40 minims
D 16 minims

Plates giving with ordinary developer hard and glassy negatives, give with this modification, very satisfactory results.

47.—Pyro Developer, with Ammonia.

A.—Bromide ammonium ¼ ounce
Water 8 ounces
B.—Stronger ammonia (0.900) 1 ounce
Water 7 ounces
C.—Pyrogallol 1 drachm
Nitric acid 5 minims
Water 12 ounces

Take for correct exposure of A 40 minims, of B 20 minims, of C ½ ounce, and 2 ounces of water.

48.—Pyro Developer, with Carbonate of Sodium.

A.—Dissolve 2 ounces of granulated sulphite of sodium and ¼ ounce of meto-bisulphite of potassium in 32 ounces of distilled water, and add 1 ounce of pyrogallic acid.

Keep in well-stoppered bottles.

B.—Dissolve 8 ounces of granulated, or 16 ounces of crystallized, carbonate of sodium (common washing soda), in water enough to make a bulk of 32 ounces.

Mix 1 ounce of water with 1 drachm of A, add a few drops of B, and increase gradually till development proceeds regularly. If necessary, restrain with 10 per cent. solution of bromide of potassium.

49.—Pyro Developer, with Carbonate of Potassium.

A.—Pyro 1 ounce
Sulphite of sodium, granulated 2 ounces
Bromide of potassium 80 gr.
Citric acid 60 gr.
Water 12 ounces
B.—Water 12 ounces
Sulphite of sodium, granulated 1 ounce
Carbonate of potash 3 ounces

1 drachm of each—A and B—to 1 ounce of water, make the developing solution.

50.—Hydrochinon Developer.

A.—Hydrochinon ¼ ounce
Sulphite of sodium, granulated 1 ounce
Meta-bisulphate of potassium 30 gr.
Water 16 ounces
B.—Carbonate of potassium 1½ ounces
Water 16 ounces

51.—Hydrochinon Developer in One Solution.

Hydrochinon ½ ounce
Sodium sulphite, granulated 2 ounces
Potassium carbonate 2 ounces
Water 32 ounces

For use, dilute 1 volume with 3 volumes of water.

52.—The Acid Fixing and Clearing Bath.

Add 2 ounces of S. P. C. Clarifier (acid bisulphite of sodium) solution to 1 quart of hypo solution 1 in 5.

53.—Combined Alum and Hypo Bath.

Add saturated solution of sulphite of sodium to saturated solution of alum till the white precipitate formed remains undissolved, and when the odor of sulphurous acid becomes perceptible.

Mix this solution with an equal bulk of freshly-prepared hypo solution 1 in 5, and filter.

This bath will remain clear.

54.—Clearing Solution (Edward's).

Alum	1 ounce
Citric acid	1 ounce
Sulphate of iron, crystals	3 ounces
Water	20 ounces

This should be freshly mixed.

55.—Clearing Solution.

Saturated solution of alum	20 ounces
Hydrochloric acid	1 ounce

Immerse negative after fixing and washing. Wash well after removal.

56.—Belitzki's Method for Removing the Last Traces of Hypo.

Chloride of Lime	20 Gm.
Water	1 liter

Add to the milky liquid

Sulphate of zinc	40 Gm.

dissolved in from 80 to 100 C.c. of water; shake well and decant.

The clear, supernatant solution of hypochlorite of zinc is kept in well-closed bottles; 1 part of it mixed with 60 parts of water will remove the last traces of fixing soda.

The solution remains active as long as it smells of hypochlorous acid.

57.—To Remove Hypo from Films.

A solution of bromine in water, about 1 in 30, destroys the hypo in a gelatine film.

58.—Intensifier, with Mercury and Ammonia, for Gelatine Dry-Plates.

Pour over the well-washed negative a saturated solution of mercuric chloride (bichloride of mercury); do not keep it on too long, unless the negative is very thin. Wash well, and immerse in bath of

Water	10 ounces
Ammonia	10 minims

Leave the plate in this solution until the black color goes quite through the film. Wash well.

59.—Intensifier (Mercuric) with Sodium Sulphite, for Gelatine Dry-Plates.

Whiten the negative in the saturated solution of mercuric chloride, wash and blacken with a solution of sulphite of sodium 1 in 5. Wash well.

The reduction is perfect, with a positive black tone.

60.—Intensifier with Iodide of Mercury.

Dissolve 1 drachm of bichloride of mercury in 7 ounces of water and 3 drachms of iodide of potassium in 3 ounces of water, and pour the iodide solution into the mercury till the red precipitate formed is completely dissolved.

For use, dilute with water, flow over the negative till the proper density is reached, and wash, when the deposit will turn yellow. Remove the yellow color by flowing a 5 per cent. solution of hypo over the plate, and give it the final washing.

61.—Intensifier for Gelatine Dry-Plates with Mercuric Chloride and Hydrochinon (Dr. Mallman).

After whitening in the saturated solution of mercuric chloride, as usual, treat with an old hydrochinon developer; the result is a bluish-black intensification, which is applicable to positives as well as negatives.

62.—Reducer for Gelatine Dry-Plate Negatives (Farmer's).

Sat. sol. of ferricyanide of potassium	1 part
Hyposulphite of sodium solution, 1 in 10	10 parts

63.—Reducer for Gelatine Dry-Plates.

Perchloride of iron	30 gr.
Citric acid	60 gr.
Water	1 pint

64.—Belitski's Acid Ferric-Oxalate Reducer for Gelatine Plates.

Water	7 ounces
Potassium ferric oxalate	2½ drachms
Crystallized neutral sulphite of sodium	2 drachms
Powdered oxalic acid, from	30 to 45 gr.
Hyposulphite of soda	1½ ounces

The solution must be made in this order, filtered, and be kept in tightly-closed bottles; and as under the influence of light the ferric salt is reduced to ferrous, the preparation must be kept in subdued light.

65.—To Reduce Intensity of Negatives.

Rub the parts to be reduced with a soft rag moistened with alcohol, till the density is softened down. For sharply defined outlines, use a pointed stick of soft wood dipped in alcohol.

The method may be well applied for the brightening up of flare spots and halation marks.

ORTHOCHROMATIC METHODS BY BATHING.

66.—Orthochromatic Dry-Plates—F. Ives' Chlorophyll and Eosine Process.

Use any good bromide collodion emulsion that contains no free nitrate of silver. Flow plate as usual, and as soon as the emulsion film sets, flow several times with strong alcoholic solution of chlorophyll from blue myrtle, or plantain leaves; then immerse in water strongly tinted with blue shade eosine, and keep in motion until smooth.

Sensitizes for all colors, including deep ruby red; a very light-yellow screen is sufficient to secure correct rendering of color-tone.

67.—Orthochromatic Dry-Plates—V. Schumann's Cyanine Bath.

Soak the plate in 200 C.c. of water and 2 to 4 C.c. of stronger ammonia for two or three minutes, then immerse in

Distilled water	200 C.c.
Alcohol	10 C.c.
Stronger ammonia (0.900)	4 C.c.
Alcoholic solution of cyanine, 1 in 500	10 C.c.

68.—Orthochromatic Dry-Plates—Erythrosine Bath (Mallmann and Scolik).

Preliminary Bath.

A.—Water	200 C.c.
Stronger ammonia	2 C.c.

Soak the plate for two minutes.

Color Bath.

Erythrosine solution, 1 in 1000	25 C.c.
Stronger ammonia (0.900)	4 C.c.
Water	175 C.c.

The plate should not remain longer in this bath than one and a quarter minutes.

69.—Obernetter's Method with Nitrate of Silver.

Distilled water	480	C.c. = 16	fluid ounces
Nitrate of silver	1.25	Gr. = 20	gr.
Ammonium carbonate	5	Gr. = 75	gr.
Erythrosine solution (1 in 500)	35	C.c. = 1⅛	fluid ounces
Stronger ammonia (0.900)	4	C.c. = 1	drachm

Bathe the plate in the preliminary solution (see No. 68) for 150 seconds. Without washing flow the sensitizing solution over the plate twice, and dry in the dark closet.

70.—To Prepare Yellow Glass Screens.

Take of crushed (not powdered) curcuma root, 2 ounces, and macerate in 10 ounces of alcohol for three days. After filtering the tincture, mix with an equal bulk of ether, and add to each ounce of the mixture 6 grains of gun cotton.

With this collodion coat a plane parallel glass plate, which must be perfectly white, thin, and without any curvature.

VARNISHES.

71.—Negative Varnishes.

Sandarac	4 ounces
Alcohol	24 ounces
Oil of lavender	3 ounces
Chloroform	5 drachms

72.—Negative Varnish.

White hard varnish	15 ounces
Alcohol	25 ounces

This will be found a good and cheap varnish if durability is not required, as it is easily rubbed up for retouching upon and easily cleaned off. Very suitable for enlarged negatives that are not to be retained.

73.—NEGATIVE VARNISH.

Tough, hard and durable.

Shellac	1¼ ounces
Mastic	¼ ounce
Oil of turpentine	¼ ounce
Sandarac	2¼ ounces
Venice turpentine	¼ ounce
Camphor	20 gr.
Alcohol	20 fluid ounces

74.—NEGATIVE VARNISH.

Sandarac	90 ounces
Venice turpentine	36 ounces
Oil of lavender	10 ounces
Alcohol	500 fluid ounces

75.—STANDARD PHOTOGRAPHIC VARNISH.

White shellac	8 ounces
Orange shellac	4 ounces
Sandarac	1 ounce
Alcohol	60 fluid ounces

76.—RETOUCHING MEDIUM.

Dammar	70 gr.
Yellow resin	6 drachms
Oil of turpentine	4 ounces

77.—NEGATIVE RETOUCHING VARNISH.

Sandarac	1 ounce
Castor oil	80 gr.
Alcohol	6 ounces

First dissolve the sandarac in the alcohol, and then add the oil.

78.—GROUND-GLASS VARNISH.

Sandarac	90 gr.
Mastic	20 gr.
Ether	2 fluid ounces
Benzol	½ to 1½ fluid ounces

The proportion of the benzole added determines the nature of the mat obtained.

79.—ENCAUSTIC PASTE.

Pure white wax	500 parts
Elemi	10 parts
Benzol	200 parts
Oil of lavender	300 parts
Oil of spike	15 parts

PRINTING AND TONING ON ALBUMENIZED, PLAIN AND OTHER PAPERS.

80.—THE SILVER PRINTING BATH.

Silver nitrate	50 gr.
Water	1 ounce

Neutralize with carbonate of silver.

81.—MODIFIED SILVER BATH.

Silver nitrate	50 gr.
Ammonium nitrate or magnesium nitrate	50 gr.

To secure a neutral state of the bath, a little carbonate of silver should be kept at the bottom of the stock bottle.



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"NEARER MY GOD TO THEE."

82.—The Price Toning Formula.

Into 7½ ounces of water dissolve 15 grains chloride of gold and sodinm, then add to it 300 grains of acetate of soda and 7 drops of a saturated solution of chloride of lime.

This stock solution should be prepared at least twenty-four hours before being used. Take ½ ounce of it and mix with 5 ounces of water.

83.—The Photographic Times Toning Bath.

Into 7½ ounces of water put 7½ grains chloride of gold and sodium. Label the bottle containing the mixture: *Chloride of gold solution.* Combine 6 ounces of water with 1 ounce *of French azotate*, to which add 1½ ounces of the chloride of gold solution.

84.—Borax Toning Bath.

Chloride of gold solution, 1:50	3 C.c.
Borax solution, 1 to 10	100 C.c.
Water	100 C.c.

Can be used immediately.

85.—Charles W. Hearn's Toning Baths.

With Sal Soda.

Distilled water	64 ounces
Acid sol. of chloride of gold (4 grains to 1 ounce)	1 ounce
Saturated solution of carbonate of sodium cryst.	½ ounce

Should be prepared half an hour before use.

With Chloride of Lime.

Water	40 ounces
Chloride of lime	5 gr.
Chloride of gold	4 gr.

86.—Abney and Robinson's Toning Baths.

Chloride of gold	1 gr.
Sodium carbonate	10 gr.
Water	10 ounces

Should be used immediately after mixing. This bath gives purple and black tones.

87.—With Chalk and Chloride of Lime.

Chloride of gold	2 gr.
Saturated sol. of chloride of lime	2 drops
Chalk	1 pinch
Water	16 ounces

The bath should be prepared with hot water, and be kept for one day before using it.

88.—Dr. Liesegang's Toning Bath.

With Tungstate of Sodium.

Tungstate of sodium	20 Gm.
Boiling water	1 liter
Chloride of gold	1 Gm.

89.—Dr. Liesegang's Toning Bath.

With Phosphate of Sodium.

Phosphate of sodium	15 Gm.
Chloride of gold	1 Gm.
Water	1 liter

90.—Dr. Liesegang's Toning Bath.

With Carbonate of Lime (Chalk).

Chloride of gold	1 Gm.
Carbonate of sodium	15 Gm.
Chalk	5 Gm.
Water	1 liter

After twelve hours the bath is perfectly clear and colorless, when it is ready for use. It is very durable, and gives fine tones.

91.—Toning Bath for Ready Sensitized Paper.

A.—Chloride of gold	1 Gm.
Water	1 liter
B.—Borax	10 Gm.
Tungstate of sodium	40 Gm.
Water	1 liter

92.—Printing on Plain Paper.

Prepare the plain paper with

Ammonium chloride	60 to 80 gr.
Sodium citrate	100 gr.
Sodium chloride	20 to 30 gr.
Gelatine	10 gr.
Distilled water	10 ounces

or,

Ammonium chloride	100 gr.
Gelatine	10 gr.
Water	10 ounces

The gelatine is first swelled in cold water and then dissolved in hot water, and the remaining components of the formula are added. The solution is filtered, and when still warm the paper floated upon it for three minutes.

The salted paper is sensitized upon a neutral 45-grain silver bath.

93.—Red Prints for Photo-Engravers.

Citric acid	100 gr.
Ammonium chloride	100 gr.
Gelatine	10 gr.
Water	10 ounces

Dissolve the citric acid in a small portion of water, and exactly neutralize with carbonate of soda (228 grains of common washing soda are required).

Float the paper on this bath for one to two minutes, and sensitize upon a 50-grain nitrate of silver solution. Fix in fresh hypo, without toning.

94.—Platinum Toning Bath, for Plain Silver Prints.

Chloroplatinite of potassium	1 Gm.
Water	1 liter
Nitric acid	5 to 10 drops

95.—Toning Silver Prints After Fixing (Pizzighelli).

Ammonium sulphocyanate	300 Gm.
Gold chloride	3 Gm.
Potassium hydrate	3 Gm.
Water	1000 Gm.

96.—How to Print on Whatman's Drawing Paper.

Salt the paper in

Water	560 Gm.
Arrowroot (boiled)	18 Gm.
Ammonium chloride	16 Gm.

by floating. Dry in horizontal position, and sensitize with a

Silver nitrate solution.....60 Gm. to 240 Gm. of water

to which

Citric acid.....25 Gm. in 240 Gm. of water

is added.

Print till a metallic lustre appears in the deeper shadows.

Tone with

Chloroplatinite of potassium	4 Gm.
Water	560 Gm.
Nitric acid	1 to 2 Gm.

Fix in the ordinary hypo bath made alkaline with a few drops of ammonia.

The resulting tones are of a warm brown, when, adding sodium bisulphite to the hypo, the color will turn to a positive black.

97.—Pizzighelli's Platinum Paper.

1.—Chloroplatinite of potassium	10 Gm.
Distilled water	60 Gm.
2.—Ferric oxalate	20 Gm.
Oxalic acid	1.5 Gm.
Water	100 Gm.
3.—2 per cent. solution of chlorate potassium	0.4 Gm.

For use, mix of

1	48 Gm.
2	30 Gm.
3	8 Gm.
Water	8 Gm.

The paper is coated with this solution by means of brusn, sponge or cotton tuft.

Dry quickly without the application of heat, and keep the sensitive paper in a box and free from moisture.

When sufficiently exposed, develop with

Oxalate potassium	140 Gm.
Water	500 Gm.

acidified slightly with oxalic acid.

Fix in 1 part of hydrochloric acid and from 60 to 80 of water; finally wash.

The acid fixing bath should be applied three or four times successively.

When adding to the above developer from 1 to 2 Gm. of mercuric chloride, the otherwise black tone will change to an agreeable brown.

ARISTOTYPE OR CHLORIDE OF SILVER COLLODION AND CHLORIDE OF SILVER GELATINE PRINTING

98.—Aristotype, or Chloride of Silver Collodion.

A.—Nitrate of silver	8 Gm.
Alcohol	100 C.c.
B.—Chloride of strontium	2 Gm.
Alcohol	100 C.c.

C.—Citric acid	5 Gm.
Water	100 C.c.
D.—Ether	100 C.c.
Gun cotton	4 Gm.
Alcohol	100 C.c.

To 100 C.c. collodion (D) add first, by constant agitation, 10 C.c. of B and 10 C.c. of C; finally add 5 C.c. of A by vigorously shaking the mixture. The resulting emulsion is allowed to settle for twenty-four hours, and is then used for coating paper.

99.—Chloride of Silver Collodion (Geldmacher's).

Solution 1.

Gun cotton	6½	fluid drachms
Ether	15	fluid ounces
Alcohol	15	fluid ounces
Castor oil	1	drachm

Solution 2.

Nitrate of silver, 5 drachms	8	gr.
Water	6	drachms
Alcohol	1½	ounces

Dissolve in a warm water bath.

Solution 3.

Citric acid, 1 drachm	15	gr.

dissolved in

Alcohol	2½	ounces

and

Chloride of strontium, 1 drachm	15	gr.

dissolved in

Alcohol	2½	ounces

Make the two solutions separately and mix.

After all the solutions have been made, add No. 3 to No. 1, shake vigorously, and by subdued light add gradually, and in small portions at a time, the No. 2 solution by constant agitating.

After an hour's ripening, the collodion emulsion is ready for use.

The paper to be coated must be furnished with a substratum of sulphate of barium and gelatine.

100.—Woodbury's Formula for Gelatine Aristotypes.

Water	8	ounces
Silver nitrate	¼	ounce
Rochelle salts	20	gr.
Ammonium chloride	10	gr.
Alum	50	gr.
Citric acid	1	drachm
Gelatine	1	ounce

Dissolve the gelatine in 6 ounces of water, the silver nitrate and the citric acid in 1 ounce of water, and the salts and alum in another ounce of water; add latter solution to gelatine, and stir well and pour in the silver solution gradually.

101.—Liesegang's Toning Bath for Aristotypes.

A.—Water	20	ounces
Sulphocyanate of ammonium	1	ounce
Alum	1	ounce
Saturated solution of carbonate of ammonium	20	drops
B.—Water	50	ounces
Chloride of gold	15	gr.

102.—A. Stieglitz's Toning Bath for Aristotypes.

1.—Phosphate of sodium	3 drachms
Water	32 ounces
2.—Chloride of gold	15 gr.
Water	16 ounces

Mix. Allow to stand for twenty-four hours.

103.—Liesegang's Combined Toning Bath.

Water	32 ounces
Hyposulphite of sodium	8 ounces
Sulphocyanate of ammonium	1 ounce
Acetate of sodium	½ ounce
Saturated solution of alum	2 ounces

and

Water	8 ounces
Chloride of gold	15 gr.
Chloride of ammonium	30 gr.

Pour the gold solution into the hypo solution, then add 30 grains of freshly prepared chloride of silver.

104.—Combined Fixing and Toning Bath for Chloride of Silver Gelatine Paper.—Dr. F. Stolze's.

Hyposulphite of sodium	35 Gm.
Common salt	9 Gm.
Alum	4 Gm.
Sulphocyanate of ammonium	2 Gm.
Water	150 to 200 C.c.

The compound will have matured for use in four to eight days.

Decant the clear solution from the deposit formed and filter. Immediately before use, add to above quantity, 2 C.c. chloride of gold solution 1 in 100. If the solution does not act with sufficient energy, a few C.c. of saturated alum solution may be added.

105.—Ilo Collodion Paper—Separate Toning Bath.

Metric weight.	Apothecaries' weight.
Stock Solution No. 1.	
2000 grammes water.	½ gallon water.
90 grammes acetate soda fused.	3 ozs. acetate soda fused.
Stock Solution No. 2.	
2000 grammes water.	½ gallon water.
30 grammes sulpho cyanide ammonia.	1 oz. sulpho cyanide ammonia.
Stock Solution No. 3.	
1 gramme chloride gold.	15 grains chloride of gold.
250 grammes water.	8 ozs. water.

Mix bath two hours before using, in the following proportions: No. 1, four parts; No. 2, one part, and No. 3, two parts.

Fix in a solution one part hypo to ten parts water.

If the tone is not what you wish, then place the toned and fixed print in an old combined bath, and you can obtain any desired effect.

Another Good Separate Toning Bath.

Metric weight.		Apothecaries' weight.	
Boiling water	2000 grammes	Boiling water	½ gallon
Sulpho cyanide ammonia	75 grammes	Sulpho cyanide ammonia	2½ ounces
Citric acid	15 grammes	Citric acid	½ ounce
Alum, powdered	10 grammes	Alum, powdered	⅓ ounce
Phosphate sodium	30 grammes	Phosphate sodium	1 ounce
Chloride of gold	1 gramme	Chloride of gold	15 grains

Add two parts water to one part of this solution; it may be used one hour after mixing, when it has become cold.

Each of these Separate Baths possess good keeping qualities, and may be strengthened each time you use them by adding fresh solution.

The Ilo Combined Bath.

We recommend to those who prepare their own bath, to mix in a six or seven gallon stone jar (with hole near bottom to insert wooden faucet), in order following:

METRIC WEIGHT.		APOTHECARIES' WEIGHT.	
Water	16 liters	Water	4¾ gallons
Acetate of lead, C. P	100 grammes	Acetate of lead, C. P.	5⅛ ounces
Nitrate of lead, C. P.	160 grammes	Nitrate of lead, C. P.	5⅛ ounces
Alum, powdered	120 grammes	Alum, powdered	3⅞ ounces
Sulpho cyanide ammo., C.P.	440 grammes	Sulpho cyanide ammo., C. P.	14⅛ ounces
Citric acid	120 grammes	Citric acid	3⅞ ounces
Hypo	4000 grammes	Hypo	140 ounces
Chloride of gold	6 grammes	Chloride of gold	92 grains

Dissolve thoroughly, let stand to settle and use the clear portion only.

This bath will keep any length of time, but if kept open to the air will evaporate and get stronger; it ought to be prepared in a large jar and then drawn off into bottles.

☞ The Combined Bath must *always* have a great *excess of hypo.* The hypo is constantly decomposed by the chemicals in the *paper* and in the *bath*, and this diminishes the fixing power. An exhausted bath *tones* very quickly, but fixes insufficiently, and yellow stains and green borders around vignettes are the results. Therefore, after every twenty five cabinets toned, one-half ounce of a saturated solution of hypo must be added to the bath you are *using*.

A quart of this solution will tone 150 cabinet photos with perfect safety, and *when prints are washed previously*, 300 to 350.

It is best to use fresh bath every time, but when using old and new, always take three-quarters new, and *only one-quarter* old bath. Pour the used bath in a separate bottle.

106.—C. E. Hopkins's Omega Papers.

Separate Toning and Fixing for Omega Paper.—Print about the same as albumen paper. Wash through five or six changes of water, having the first two thoroughly alkali.

Have prepared the following solutions:

Borax (saturated solution)	1 to 12 ounces water
Acetate of soda (saturated solution)	1 to 3 ounces water
Hypo soda (saturated solution	1 to 1½ ounces water
Alum (saturated solution)	1 to 10 ounces water

For toning, use gold solution, 1 ounce; water 20 to 60 ounces; borax solution, to make nearly neutral; acetate of soda solution, 2 to 4 drachms.

Tone to nearly the desired tone, and place in plenty of water slightly acidified with acetic acid; rinse well, and fix from fifteen to thirty minutes in hypo solution, 9 to 12 ounces; borax solution, 3 to 6 ounces; liquid acid sulphite of soda, 1 drachm; alum solution, 10 to 20 ounces; water to make 1 gallon. The acid sulphite, added before the alum, prevents any precipitation. Time the fixing according to the depth of printing, tone, etc. If the high lights are clear and the print light enough, and the tone not too warm, take out in fifteen minutes; otherwise, leave in longer and strengthen the bath. The strength of the toning bath should be regulated to suit the strength of the paper, fresh paper toning much easier than old. Toning should occupy about ten minutes, and strength of bath regulated to that time.

Handle prints face down in all of the processes, and keep them moving; wash very thoroughly after fixing; mount, retouch and burnish in the ordinary way. For cleaning the surface of the prints after they are dry, use alcohol and a soft, clean cloth. In cool weather, and prints in ordinary condition, the smaller quantities indicated in the formula are sufficient; but more alum may be required in warm weather, in which case use more borax and hypo also. In case the high lights do not clear up in a reasonable time, the fixing bath should be strengthened.

Combined Bath for Omega Paper.

Hot water	1 gallon
Hypo soda	12 ounces
Borax	1 ounce
Alum	4 ounces

Dissolve thoroughly; place in evaporating dish; heat to near the boiling point (180 degs.); let cool, and filter. For use, to each 32 ounces add 1 drachm of an 8-grain solution acetate of lead, and 1 grain of gold. This ought to tone in about ten to fifteen minutes. If it should tone more rapidly than ten, add more of the stock solution; but if more slowly than fifteen, add a little more gold. Do not wash the prints previous to toning, but place them dry into the bath, one at a time, being careful to manipulate them briskly, and break all air bubbles. Do not place too many prints in the bath at once, and do not try to tone too many in a given quantity of solution. One quart of the bath will tone and fix from forty to fifty cabinets. Do not try more. Throw this away and use fresh. Should the film become soft, rinse through two or three changes of water, and soak them a few minutes in a plain bath of alum, about 4 ounces to the gallon. It is surprising what beautiful tones may be produced by this process—no indication of that "double tone" so common in combined baths. Stop the tone very nearly where you want it, as there is very little change in drying. If there is any inclination to stick to the rubbing-down paper, use a soft, wet sponge.

107.—Combined Toning and Fixing Bath (Ehrmann's).

Dissolve

Hyposulphite of soda	16 ounces

in

Water	31 ounces

Also dissolve

Alum	3 ounces

in

Water	31 ounces

Mix the two solutions and allow to stand for several days in an open jar or vessel till all sulphurous acid has evaporated. Then filter, and add 22 grains of nitrate of lead previously dissolved in water.

To 18 ounces of this solution add 5 grains of pure terchloride of gold dissolved in 2 ounces of water.

The gold solution should be added in small portions at a time, by constant stirring with a glass rod.

Twenty ounces of this bath will tone fifty 5 x 8s of any kind of aristo (chloride of silver emulsion) prints, but not more.

The best results were had upon Bradfisch Improved Aristo Paper.

PRINTING ON SUBSTANCES OTHER THAN PAPER.

108.—Collodion for Porcelain Pictures.

Fennemore's Method.

A.—Negative gun cotton	60 gr.
Alcohol	2 ounces
Ether	3 ounces

Dissolve 120 grains nitrate of silver in 3 ounces of hot alcohol, and add by constant stirring to the above collodion.

B.—Chloride of strontium	32 gr.
Citric acid	24 gr.

Reduce to a fine powder and dissolve in 4 ounces of alcohol, add

Ether	4 ounces
Gun cotton	60 gr.

The two collodions are to be mixed in equal proportions.

109. *Hern's Method.*

A.—Alcohol	7 ounces
Ether	9 ounces
Gun cotton	112 gr.
B.—Nitrate of silver	486 gr.
Distilled water	1 ounce
C.—Chloride of calcium	128 gr.
Alcohol	4 ounces
D.—Citric acid	128 gr.
Alcohol	4 ounces

Decant 8 ounces of A, add 64 drops of B in small portions, stirring up well after every addition, and 4 drachms of C in the same way. Finally 4 drachms of D must be added in the same manner as the calcium solution.

110.—Printing on Silk.

Boiling water	80 ounces
Chloride of ammonium	100 gr.
Iceland moss	60 gr.

When nearly cold, filter and immerse the silk for fifteen minutes. Sensitize for fifteen minutes in an acid 20-grain silver bath, and when dry stretch the fabric over cardboard. Print deeper than usual and tone in

Water	20 ounces
Acetate of sodium	2 drachms
Chloride of gold	3 gr.
Common whiting	a few gr.

111.—Making Silver Prints on Wood.

Gelatine	45 gr.
White soap	45 gr.
Water	5¼ fluid ounces

Soak the gelatine in water for five or six hours, then dissolve it with the aid of a water bath. Cut the soap into small pieces, and add to the gelatine solution, stirring the whole with a glass rod to insure a perfect mixture; then add powdered alum until the froth disappears, and strain through muslin. Cover the block with this mixture and a little zinc white, then wipe off so that a very thin film will be left, rubbing it gently, so that the film may be of as even a thickness as possible. After drying, apply with a badger's-hair brush a coating of the following composition:

Albumen	3¼ fluid ounces
Water	2½ fluid ounces
Chloride of ammonium	67½ gr.
Citric acid	18¾ gr.

Whip the albumen to a froth, and allow it to settle; to the limpid portion add the water, then the sal ammonia, and carefully stir with a glass rod. then add the citric acid. When the block is dry, sensitize with a solution of

Nitrate of silver.....187½ gr.
Water..... 3¼ fluid ounces

Pour this upon the surface of the block, spread it evenly with a glass rod and pour off the excess. When the block is dry, expose it under a negative in the usual manner, until it is printed the exact shade desired. When printed, immerse the printed surface in a very strong solution of salt for about three minutes. Then wash it under a stream of water for a short time, and fix it by placing it face downward in a saturated solution of hyposulphite of soda. After fixing, wash under a stream of water for about ten minutes; when dry, it is finished, and ready for the engraver.

112.—To Transfer Photographs upon Wood for Engraving.

Float the reverse side of sensitized albumen paper for fifteen minutes upon a 4 per cent. solution of bichromate of potassium; dry well; expose to light till the picture is fairly visible; place the print upon a glass plate under water until the unacted on bichromate is dissolved out; after removal from the water, roll in with fatty ink.

When the picture is sufficiently blackened, and nearly dry, it can be transferred upon the engraver's block by rubbing it on carefully.

113.—Cyanotype, or Blue Printing Process.

A.—Citrate of iron and ammonium..... 1⅞ ounces
Water..... 8 ounces
B.—Ferricyanide of potassium..... 1¼ ounces
Water..... 8 ounces

Mix equal parts immediately before use and float the paper, Rives' plain, upon it for three minutes; hang up to dry.

To Intensify Faint Blue Prints.—Soak them for five minutes in a solution of 1 drachm of ferric chloride in 32 ounces of water, and wash again.

Cyanotype Process—Black Lines upon a White Ground.

Water..... 9 ounces
Gelatine..... 3 drachms
Perchloride of iron solution (U. S. Ph.)..... 6 drachms
Tartaric acid..... 3 drachms
Ferric sulphate..... 3 drachms

Filter off any precipitate that may be found and coat any good, stout white paper with the full strength solution. Expose in sunlight till details or lines are visible, and develop with

Gallic acid..... 6 drachms
Alcohol..... 6½ ounces
Water..... 32 ounces

Wash well in several changes of water.

114.—To Tone Bromide of Silver Prints and Diapositives to a Warm Color.

A.—Uranium nitrate..... 1 Gm.
Water.....100 Gm.
B.—Potassium ferricyanate..... 2 Gm.
Glacial acetic acid..... 8 Gm.
Water.....100 Gm.

Mix immediately before use.

115.—Kallitype Printing (Formula No. 2).

Dissolve 15 Gm. of ferric oxalate in 500 C.c. of water, and 3 Gm. of silver nitrate in 500 C.c. of water. Mix the two solutions, and float the paper upon it for two minutes.

Print till the half shadows of the cliché are out, and develop in

Water.....1000 Gm.
Rochelle salts..... 10 Gm.
Borax..... 7 Gm.
And of a saturated solution of potassium bichromate from 2 to 4 drops

After exposure to light, under a diapositive or drawing immerse the print in

Gallic acid	6 drachms
Alcohol	6½ ounces
Water	32 ounces

when the greenish-yellow print will turn to inky black.

Finally wash in pure water.

USEFUL RECEIPTS.

122.—To Find the Focal Length of a Lens—W. H. Sherman's Rule.

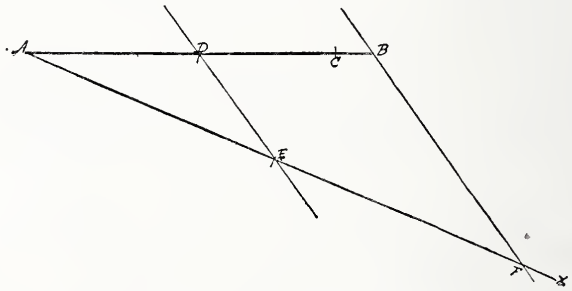
Make two images of any object of convenient length, so that the *difference* between the images will be equal to some part of the object, making the position of the ground-glass on the base of the camera where each image is in focus. The distance between the two positions of the ground-glass thus found will be the same part of the focal length that the difference of the two images is of the object.

Examples: With two images of a foot rule, let one image be 8 inches long and the other 4 inches. The difference being one-third the length of the object, the distance between the two positions of the ground-glass will be one-third of the focal length of the lens.

123.—To Calculate the Focal Fraction of Stops for Lenses.

Divide the focal length obtained by the above method expressed in inches and hundredths, by the diameter of stop opening expressed in hundredths of an inch.

124.—To Find Focal Length of a Lens (another Method, Sherman's).



Let the line AB represent the length of a given object; AC the length of its image on the ground glass, and CD the length of a smaller image; then AD will be the difference in length of the two images. Let the line AE represent the distance between the two positions of the ground glass when each image was in perfect focus on it. (AX is a line of indefinite length, making an acute angle with AB.) Draw the line DE, intersecting AB and AX; draw BF parallel to DE; AF will be the focal length.

125.—Labarraque's Solution.

Chloride of lime	2 ounces
Carbonate of sodium, cryst.	4 ounces
Water	40 ounces

Mix the chloride of lime with 30 ounces of the water; and dissolve the carbonate of soda in the remainder. Mix, boil and filter.

126.—Eau de Javelle.

Dry chloride of lime	2 ounces
Carbonate of potash	4 ounces
Water	40 ounces

Mix the chloride of lime with half of the water; dissolve the carbonate of potash in the remainder. Mix, boil and filter.

127.—A Few Remedies Against Blistering of Albumen Paper.

Do not dry the paper by excessive heat.
Avoid acidity in solutions.
Moisten the print before washing with a sponge saturated in alcohol.
Immerse the print before fixing in a weak alum.
Add a trace of aqua ammonia to the fixing bath.
Add one-tenth part of alcohol to the ordinary toning bath.

128.—Mat Black Varnish.

A tolerably strong solution of sandarac in alcohol, mixed with fine lampblack, dries without gloss, becomes hard without being brittle, and may be applied with a fine brush upon almost any substance.

129.—Invisible Ink.

Chloride of cobalt	50 gr.
Distilled water	1 fluid ounce
Glycerine	10 minims

Dissolve the chloride of cobalt in the distilled water, and add the glycerine.

Writing executed with this ink is invisible on paper, but on warming the writing turns blue. On exposure to damp air it becomes invisible again.

130.—Solution for Making Paper Adhere to Metal.

Tragacanth	30 Gm.
Gum arabic	120 Gm.
Water	500 C.c.

131.—To Precipitate Gold from Spent Sulphocyanate Toning Baths.

Add sulphuric acid and heat, when the gold will separate.

132.—To Keep Unmounted Albumen Prints Flat.

Soak them in equal parts of alcohol, glycerine and water; dry between blotting paper under slight pressure.

133.—Magic Photographs.

Fix an albumen print in perfectly fresh hypo solution and wash well, and soak it in a solution of 1 part bichloride of mercury, ¼ of a part of chloride of ammonium in 60 parts of water, till the photograph is bleached out.

The picture will appear again when brought into contact with hypo solution, or moistened blotting paper previously prepared with the fixing soda.

134.—Solution for Mounting Prints Without Their Cockling.

Nelson's No. 1 photographic gelatine	4 ounces
Water	16 ounces
Glycerine	1 ounce
Alcohol	5 ounces

Dissolve the gelatine in the water, then add the glycerine, and lastly the alcohol.

135.—Permanent Paste.

Arrowroot	10 Gm.
Water	100 Gm.

in which 1 gramme of gelatine has been soaked, and boil. After cooling add 10 grammes of alcohol and a few drops of carbolic acid.

136.—Leather Collodion.

2 p. c. collodion	100 parts
Castor oil	4 parts

137.—Lubricator for Hot Burnishing.

Spermaceti	10 Gm.
Castile soap	10 Gm.
Alcohol	1 liter

138.—To Remove Silver Stains from the Hands.

Sulphate of sodium (Glauber's salt)	½ ounce
Chloride of lime	¼ ounce
Water	1 ounce

Mix thoroughly, and apply with an old toothbrush.

139.—To Frost a Skylight.

Very thin starch paste, to which unboiled starch has been added. Must be free from lumps, and be daubed on with a large bristle brush.

140.—To Remove Nitric Acid Stains from Hands or Garments.

Touch the stains with solution of permanganate of potassium; wash, rinse in dilute hydrochloric acid, and wash again.

141.—To Remove Yellow Stains from Bromide Prints.

Soak for one or two hours in

Acetic acid	2 ounces
Saturated oxalate of potassium solution	4 ounces

142.—To Remove Pyro Stains from Fingers.

Wash with a 10 per cent. solution of oxalic acid, or sulphuric acid, diluted with water, 1:20.

143.—To Remove Yellow Stains from Pyro Developed Negatives.

Bathe them in sulphorous acid water or in a 10 per cent. solution of sulphite of soda, to which a few drops of sulphuric acid has been added.

144.—To Remove the Odor of Hydrosulphate of Ammonium from the Dark-Room.

Sprinkle the floor with a solution of nitrate of lead.

145.—To Avoid Halation.

A quick drying coating, which is applied to the back of the plate, consists of collodion, with which any dark red or brown pigment is mixed. Spanish brown or rouge answers well.

146.—To Recover Silver Bromide from Waste Emulsion.

Let the emulsion be melted, and then add a small quantity of hydrochloric acid, following by boiling for two or three minutes. The silver bromide precipitates, and the destroyed gelatine is then poured off. The bromide is then placed among the other residues for reduction.

147.—Toning Bath for Gelatine Lantern Slides.

Chloride of platinum	1 gr.
Hydrochloric acid	1 minim
Water	32 ounces

148.—Compound for Blocking Out Large Portions of a Negative.

Mix asphaltum varnish with fine lamp-black, and apply with a camel's-hair brush.

Should be kept in well-stoppered bottles.

149.—Flash-Light Powder for Orthochromatic Plates.

Pure metallic magnesium powder	10 gr
Nitrate of sodium (finely powdered)	from 50 to 70 gr.

150.—Largest and Smallest Quantities of Chemicals Admitted to the Pyro Developer.

	Largest.	Smallest.
Pyro, per ounce	10 gr.	1¼ gr.
Sulphite of sodium	80 gr.	5 gr.
Carb. of sodium	40 gr.	1 1-5 gr.
Carb. of potassium	21 2-10 gr.	5 gr.

151.—Consumption of Chemicals in Silver Printing on Albumenized Paper.

Of 100 parts of silver used in the albumen printing process will be found

In the finished print	3 per cent
In filters, blottings and cuttings	7 per cent
In the wash water before toning	50 to 55 per cent
In the fixing bath	30 to 35 per cent
In the wash water after fixing	5 per cent

90 per cent. of the silver used may be recovered.

One sheet of paper, 18 x 22, will take from the silver bath from 30 to 45 grains of nitrate of silver.

One sheet of paper, 18 x 22, requires to tone 1½ grains of gold (1 decigram).

About 80 to 90 grains of hyposulphite of sodium are necessary to fix one sheet of paper, 18 x 22.

152.—To Recover Fogged Plates.

Make a solution as follows:

Chromic acid	30 grains
Bromide of potassium	60 grains
Water	10 ounces

and immerse the plates for five minutes. Afterwards wash very thoroughly and rear up to dry.

Or, instead of the above, make the following:

Bichromate of potash	1 ounce
Hydrobromic acid	2 drachms
Water	10 ounces

If hydrobromic acid cannot be obtained, use hydrochloric acid or a soluble bromide; in the last case a few drops of sulphuric acid being added to the solution. Use as before.

TABLE SHOWING COMPARATIVE VALUE OF ALKALINE CARBONATES IN DEVELOPERS. By O. G. Mason.

Commercial Name.	Chemical Symbol.	Molecular Weight.	The Commercial Salt contains of the pure Salt about	100 parts of 36 per cent Acetic Acid Require for Saturation.	Solubility in Water (approximate).
Soda, Caustic	NaHO	40	80 to 92%	26.66 parts of 90% Soda	1 part in 2
Sodium Carbonate, Carbonate of Soda, Sal Soda, Crystals,	$Na_2CO_3.10H_2O$	286	96 to 98%	89.38 " 96% "	1 " 2
The same, anhydrous or in dry powder	Na_2CO_3	106	About 98 to 99%	89.38 of 98 to 99% dry Sal Soda.	1 " 6
Sodium Bicarbonate, Bicarbonate of Soda, "Sesqui-carbonate of Soda,"	$NaHCO_3$	84	98 to 100%	53.91 of 99% Bicarb. Soda.	1 " 12

Equal work is done by 80 parts of Caustic Soda, 286 parts of Sal Soda (crystals), 106 parts of Sal Soda (dry), 168 parts of Bicarbonate of Soda. These quantities must be increased to make up for any impurity contained in the sample being used; for this purpose the usual percentage of impurity given in the above table may be assumed for all ordinary photographical uses.

Potassa (Caustic Potash)	KHO	56	80 to 95%	37.33 parts of 90% Potassa.	1 part in 1
Potassium Carbonate, Carbonate of Potassa, Sal Tartar, Saleratus,	$K_2CO_3.1\frac{1}{2}H_2O$	165	76 to 96% Usually about 81%	51.11 parts of 81% Carb. Potassa.	1 " 1
Potassium, Carbonate, dry	K_2CO_3	140	About 95%	122.74 parts of 95% Carb. Potassa.	1 " 1
Potassium Bicarbonate, Bicarbonate of Potassa,	$KHCO_3$	100	100%	60 parts of 100% Bicarb. Potassa.	1 " 4

Equal work is done by 112 parts Caustic Potassa, 165 parts (about) ordinary Carbonate Potassa, 200 parts of Bicarbonate Potassa. These quantities must be increased in proportion to impurities, as noted in case of Soda. These two alkalies are interchangeable for doing the same amount of work when *pure*, and when the one named in a given formula can not be obtained the table may assist in choosing a substitute of proper strength and solubility.

Dry or anhydrous Carbonate of Potassium is not usually found in the market.



"PORTRAIT STUDY."
By A. MORENO.

TABLE OF STRENGTHS OF ALCOHOL.

Specific Gravities of Mixtures of Different Proportions of Alcohol (s. g. .7932) and Water, by Weight and by Volume, at 14° R. (63.5° F.) Meisner.

Parts of		Specific Gravity of Mixture by Weight.	Specific Gravity of Mixture by Volume.	Parts of		Specific Gravity of Mixture by Weight.	Specific Gravity of Mixture by Volume.
Alcohol.	Water.			Alcohol.	Water.		
100	0	0.7932	0.7932	49	51	0.9196	0.9324
99	1	0.796	0.7969	48	52	0.9219	0.9344
98	2	0.7988	0.8006	47	53	0.9242	0.9364
97	3	0.8016	0.8042	46	54	0.9264	0.9384
96	4	0.8045	0.8078	45	55	0.928	0.9404
95	5	0.8074	0.8114	44	56	0.9308	0.9424
94	6	0.8104	0.815	43	57	0.9329	0.9443
93	7	0.8135	0.8185	42	58	0.9350	0.9461
92	8	0.8166	0.8219	41	59	0.9371	0.9478
91	9	0.8196	0.8253	40	60	0.9391	0.9495
90	10	0.8225	0 8286	39	61	0.9410	0.9512
89	11	0.8252	0.8317	38	62	0.9429	0.9529
88	12	0.8279	0.8346	37	63	0.9448	0.9547
87	13	0.8304	0.8373	36	64	0.9467	0.9564
86	14	0.8329	0.840	35	65	0.9486	0.958
85	15	0.8353	0.8427	34	66	0.9505	0.9695
84	16	0.8376	0.8454	33	67	0.9524	0.9609
83	17	0.8399	0.8581	32	68	0.9543	0.9621
82	18	0.8422	0.8508	31	69	0.9561	0.9632
81	19	0.8446	0.8534	30	70	0.9578	0.9643
80	20	0.847	0.8561	29	71	0.9594	0.9654
79	21	0.8494	0.8596	28	72	0.9608	0.9665
78	22	0.8519	0.8616	27	73	0.9621	0.9676
77	23	0.8543	0.8642	26	74	0.9634	0.9688
76	24	0.8567	0.8668	25	75	0.9647	0.970
75	25	0.859	0.8695	24	76	0.966	0.9712
74	26	0.8613	0.8723	23	77	0.9673	0.9723
73	27	0.8635	0.8751	22	78	0.9686	0.9734
72	28	0.8657	0.8779	21	79	0.9699	0.9745
71	29	0.868	0.8806	20	80	0.9712	0.9756
70	30	0.8704	0.8833	19	81	0.9725	0.9766
69	31	0.8729	0.886	18	82	0.9738	0.9775
68	32	0.8755	0.8885	17	83	0.9751	0.9784
67	33	0.8781	0.891	16	84	0.9763	0.9793
66	34	0.8806	0.8934	15	85	0.9795	0.9803
65	35	0.8831	0 8958	14	86	0.9786	0.9813
64	36	0.8855	0.8982	13	87	0.9796	0.9823
63	37	0.8879	0.9096	12	88	0.9806	0.9834
62	38	0.8902	0.9029	11	89	0.9817	0.9846
61	39	0.8925	0.9052	10	90	0.9830	0.9849
60	40	0.8948	0.9075	9	91	0.9844	0.9873
59	41	0.8971	0.9098	8	92	0.9860	0.9888
58	42	0.8994	0.9121	7	93	0.9878	0.9901
57	43	0.9016	0.9145	6	94	0.9897	0.9915
56	44	0.9038	0.9168	5	95	0.9914	0.9929
55	45	0.9060	0.9191	4	96	0.9931	0.9943
54	46	0.9082	0.9214	3	97	0.9948	0.9957
53	47	0.9104	0.9237	2	98	0.9965	0.9971
52	48	0.9127	0.9259	1	99	0.9982	0.9985
51	49	0.915	0.9281	0	100	1.0000	1.0000
50	50	0.9173	0.9303	..	..		

TABLE OF THE SYMBOLS, ATOMICITY, ATOMIC AND EQUIVALENT WEIGHTS OF THE ELEMENTS.

Name.	Symbol.	Atomicity.	Atomic Weight.	Equivalent Weight.
Aluminum	Al	iii (iv)	27.5	13.7
Antimony (Stibium)	Sb	iii (v)	122.0	122.0
Arsen	As	iii (v)	75.0	75.0
Barium	Ba	ii	137.0	68.5
Beryllium (Glucinum)	Be	ii or iii	9.4	4.7
Bismuth	Bi	iii (v)	208.0	208.0
Boron	Bo	iii (v)	11.0	11.0
Bromine	Br	i (iii, v, vii)	80.0	80.0
Carbon	C	iv	12.0	6.0
Cadmium	Cd	ii	112.0	56.0
Caesium	Cs	i	133.0	133.0
Calcium	Ca	ii	40.0	20.0
Cerium	Ce	iii (iv)	138.0	46.0
Chlorine	Cl	i (iii, v, vii)	35.5	35.5
Chromium	Cr	iv (vi)	52.2	26.1
Cobalt	Co	ii (iv)	58.8	29.4
Copper	Cu	ii	63.4	31.7
Didymium	Di	iii	145.0	
Erbium	E	iii	169.0	
Fluorine	F	i	19.0	19.0
Gallium	Ga	iv	68.0	
Germanium	Ge	iv	72.2	
Glucinum	G	ii	9.4	4.7
Gold	Au	i (iii)	196.0	196.0
Hydrogen	H	i	1.0	1.0
Indium	In	iii (iv?)	113.4	37.8
Iodine	I	i, iii, v, vii	127.0	127.0
Iridium	Ir	ii (iv, vi)	198.0	99.0
Iron	Fe	ii (iv, vi)	56.0	28.0
Lanthanium	La	iii	139.0	46.3
Lead (Plumbum)	Pb	ii (iv)	207.0	103.5
Lithium	Li	i	7.0	7.0
Magnesium	Mg	ii	24.0	12.0
Manganese	Mn	ii (iv, vi, vii)	55.0	27.5
Mercury	Hg	ii	200.0	100.0
Molybdenum	Mo	vi	96.0	46.0

TABLE OF THE SYMBOLS, ETC.—(*Continued.*)

Name.	Symbol.	Atomicity.	Atomic Weight.	Equivalent Weight.
Niobium (Columbium)	Nb	v	94.0	18.8
Nickel	Ni	ii (iv)	58.8	29.4
Nitrogen	N	iii (v)	14.0	14.0
Osmium	Os	ii (iv, vi, viii)	199.0	99.5
Oxygen	O	ii (iv?)	16.0	8.0
Palladium	Pd	(ii, iv, vi)	106.6	53.25
Phosphorus	P	iii (v)	31.0	31.0
Platinum	Pt	ii (iv, vi)	197.4	98.7
Potassium (Kalium)	K	i	39.0	39.0
Rhodium	Rh	ii (vi)	104.4	52.2
Rubidium	Rb	i (v)	85.4	85.4
Ruthenium	Ru	ii (iv, vi, viii)	104.4	52.2
Scandium	Sc	ii (iv, vi, viii)	43.9	52.2
Selenium	Se	ii (iv, vi)	79.4	39.7
Silicon (Silicium)	Si	iv	28.0	14.0
Silver (Argentum)	Ag	i	108.0	108.0
Sodium (Natrium)	Na	i	23.0	23.0
Strontium	Sr	ii	87.5	43.7
Sulphur	S	ii (iv, vi)	32.0	16.0
Tantalum	Ta	v	182.0	36.4
Tellurium	Te	ii (iv, vi)	127.0	64.0
Thallium	Tl	i (iii)	204.0	204.0
Thorium	Th	iv	231.5	57.87
Tin (Stannum)	Sn	ii, iv	118.0	59.0
Tungsten (Wolfram)	W	iv, vi	184.0	92.0
Uranium	U	vi (iv)	240.0	60.0
Vanadium	V	iii (v)	51.2	51.2
Ytterbium	Yt	iv	172.6	17.1
Yttrium	Y	ii	61.7	30.85
Zinc	Zn	ii	65.0	32.5
Zirconium	Zr	iv	90.0	44.8

TABLE OF SYMBOLS, ATOMIC WEIGHT AND SOLUBILITIES OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY.

Abbreviations.—s., soluble; v. s., very soluble; sp. s., sparingly soluble; n. s., not soluble; dec., decomposed; del., deliquescent.

Name.	Symbol.	Molecular Weight.	One Part is Soluble in Cold Water.	One Part is Soluble in Hot Water.	Alcohol.
Acid, Acetic	$C_2H_4O_2$	60	in any proportion.		
" Boric or Boracic	H_3BO_3	62	25	3	6
" Carbolic (see Phenol)	C_6H_6O	94	16.6	3	6
" Citric	$C_6H_8O_7+H_2O$	210	0.75	0.5	s.
" Digallic (see Tannin)	$C_{27}H_{22}O_{17}$	618	0.8	0.5	0.8
" Gallic	$C_7H_6O_5+H_2O$	188	100	3	8
" Hydrobromic	HBr	81	s.	s.	s.
" Hydroiodic	HI	128	s.	s.	s.
" Hydrochloric	$HCl+7H_2O$	36.5	s.	s.	s.
" Hydrofluoric	$HFl+3H_2O$	74	s.	s.	s.
" Hydrocyanic	HCy	27	s.	s.	s.
" Hydrosulphuric	H_2S	34	s.	s.	s.
" Muriatic (see Hydrochloric)					
" Nitric	HNO_3	63	in all proportions.		
" Nitrous	HNO_2	47	absorbed.		
" Oxalic	$C_2H_2O_4+2H_2O$	126	8	0.2	s. also in ether
" Pyrogallic (see Pyrogallol)	$C_6H_6O_3$	126	2	v. s.	also v. s. in ether.
" Salicylic	$C_7H_6O_3$	138	7.6	9	also v. s. in ether.
" Sulphuric	H_2SO_4	98	in all proportions.		
" Sulphurous	H_2SO_3	82	absorbed.		
" Tannic (see Digallic)					
" Tartaric	$C_4H_6O_4$	150	0.8	0.5	5
Alcohol, Ethyl	C_2H_6O	46	in all proportions.		

			in all proportions.		
Alcohol, Methyl (see Wood Alcohol)	CH_4O	32			
Alum (see Potassium Aluminium Sulphate)	$Al_2(SO_4)_3K_2SO_424H_2O$	948	10	8	n. s.
Alum Chrome (see Potassium Chromic Sulph.)	$Cr_2(SO_4)_3K_2SO_424H_2O$	999	10	dec.	n. s.
Amidol (Diamido Phenol)	$C_6H_8N_2O$	124	very	soluble.	
Ammonia, Gaseous	NH_3	17	very	soluble.	
Ammonium Bichromate	$(NH_4)_2Cr_2O_7$	252	v. s.	v. s.	
" Bromide	NH_4Br	98	1.29	0.7	31.5
" Cadmium Bromide	$2NH_4Br2CdBr_2+H_2O$	584	0.73		5.3
" " Iodide	$2NH_4ICdI_2+2H_2O$	692	0.58		0.70
" Chloride	NH_4Cl	53.5	3	1	sp. s.
" Ferric Oxalate	$Fe_2(C_2O_4)_6(NH_4)_6+8H_2O$	892	2.10	0.29	sp. s.
" Fluoride	NH_4Fl	37	v. s.	v. s.	sp. s.
" Iodide	NH_4I	145	1	0.5	s.
" Nitrate	NH_4NO_3	80	2	1	s.
" Oxalate	$(NH_4)_2C_2O_4$	124	4	2	s.
" Sulphide	NH_4HS	51	v. s.	v. s.	o. s.
" Sulpho-Cyanate	NH_4CNS	76	s.	s.	s.
Aurantia (Hexanitro-diphenylamin Ammonia)	$C_{12}H_4(NO_2)_6N,NH_4$	456			
Aurin (Trioxy-triphenyl-Carbinol)	$C_{19}H_{14}O_3$	290			
Barium Chloride	$BaCl_2+2H_2O$	345	2 18	1.5	sp. s.
" Nitrate	$Ba(NO_3)$	261	12.2	2.84	n. s.
" Per-oxide	BaO_2	169	v. s.	n. s.	n. s.
Benzole or Benzine (Trioxy-triphenyl-Carbinol)	C_6H_6	78	n. s.	n. s.	s.
Borax (see Sodium Biborate)					
Cadmium Bromide	$CdBr_2+4H_2O$	344	1.5	1	sp. s.
" Iodide	CdI_2	366	1 5	1	s.
Calcium Bromide	$CaBr_2+4H_2O$	272	1	.75	s.
" Carbonate (see Chalk)	$CaCO_3$	100	n. s.	n. s.	n. s.
" Chloride	$CaCl_2$	111	.75	.5	10.
" Hypochlorite (see Chloride of Lime)	$CaCl_2O_2CaCl_2$(?)	254	sp. s.	sp. s.	dec.
Calomel (see Mercurous Chloride)					
Camphor	$C_{10}H_{16}O$	152	1000		v. s.
Caustic Potash (see Potassium Hydrate)					
" Soda (see Sodium Hydrate)					
Chalk (see Calcium Carbonate)					

TABLE OF SYMBOLS, ATOMIC WEIGHT AND SOLUBILITIES OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY.

Abbreviations.—s., soluble; v. s., very soluble; sp. s., sparingly soluble; n. s., not soluble; dec., decomposed; del., deliquescent.

NAME.	SYMBOL.	MOLECULAR WEIGHT.	ONE PART IS SOLUBLE IN COLD WATER.	ONE PART IS SOLUBLE IN HOT WATER.	ALCOHOL.
Chinoline Blue or Cyanine	$C_{29}H_{35}NaI$	538	sp. s.	sp. s.	s.
" Red	$C_{26}H_{19}NaCl$	394.5			
Chloride of Lime (see Calcium Hypochlorite)					
Chlorine	Cl	35.5	absorbed by 1 to 2.5 vols.		
Chloroform	$CHCl_2$	119.5	sp. s.	sp. s.	v. s.
Chrome Alum (see Alum Chrome)					
Copper Acetate (see Verdigris)	$Cu(C_3H_3O_2)_2,H_2O$	199	14	5	1 in 14
" Bromide	$CuBr_2$	223.4	1	.75	s.
" Chloride	$CuCl_2,H_2O$	170.5	1	.75	v. s.
" Sulphate (see Blue Vitriol)	$CuSO_4,5H_2O$	249.2	3	1	n. s.
" " and Ammonia	$CuSO_4,4NH_3+H_2O$	245.5	s.	v. s.	n. s.
Corrosive Sublimate (see Mercuric Chloride)					
Dextrine	$C_6H_{10}O_5$	162	easily s.		n. s.
Eikonogen (Amido-β-Naphthol-β-Monosulphonate of Sodium)	$C_{10}H_8SO_2NaN$	261	40	e. s.	s.
Eosine, Yellow Shade (Tetra Bromo-fluoresceine Potassium)	$C_{20}H_6Br_4O_5K_2$	724	s.	s.	s.
Eosine, Red Shade (Tetra Brom.-fluores. Sod.)	$C_{20}H_6Br_4O_5Na_2$	692	s.	s.	s.
Epsom Salt (see Magnesium Sulphate)					
Erythrosine M. (Tetra Iodo-fluoresceine Potassium or Sodium)	$C_{20}H_6I_4O_5K_2$ or Na_2	912 or 880	s.	s.	s.
Erythrosine G. (Di-iodo-fluoresceine Potassium or Sodium)	$C_{20}H_6I_2O_5K_2$ or Na_2	660 or 628	s.	s.	s.

Gelatine, Glutine	49,3C,6,6H18,3N25,8O	1267.2	sp. s.	e. s.	n. s.
Glycerine	$C_3H_8O_3$	92	in all proportions.		
Glycine (Oxy-phenylglycine)	$C_8H_9O_3N$	167			
Gold, Neutral Chloride	$AuCl_3$	303.5	1	5	also in ether.
" and Cadmium Chloride	$CaAuCl_5$	414.5	s.	s.	s.
" and Potassium Chloride	$KAuCl_4+5H_2O$	468	s.	s.	s.
" and Sodium Chloride	$NaAuCl_4+8NaCl+2H_2O$	892	s.	s.	s.
" Sodium Hyposulphite	$AuNa_3S_4+2H_2O$	525	s.	s.	s.
Gun Cotton (Tetra-nitrate Cellulose)	$C_{12}H_{16}O_6(NO_3)_4$	564	n. s.	n. s.	} in ether
" " (Tri-nitrate Cellulose)	$C_{10}H_{17}O_7(NO_6)_3$	459	n. s.	n. s.	} alcohol
Hydrochinone	$C_6H_6O_2$	110	s.	s.	also in ether.
Hydroxylamine Hydrochlorate	NH_3OHCl	69.5	0.6	e. s.	4
Iodine	I	127	sp. s.	sp. s.	e. s.
Iridium Tetra-chloride	$IrCl_4$	335			
Iron, Ammonium Sulphate	$FeSO_4(NH_4)_2SO_4+6H_2O$	392	v. s.	dec.	n. s.
" Chloride (Ferric)	Fe_2Cl_6	325	.75	.5	1 in 1
" Chloride (Ferrous)	$FeCl_2$	127	2	1	1 in 1
" Citrate	$Fe_2(C_6H_5O_7)_2$	598	s.	s.	n. s.
" Citrate and Ammonia	$(C_6H_5O_7)_2Fe_2(NH_4)_3$	355	s.	s.	sp. s.
" Iodide	FeI_2	310	v. s.	v. s.	v. s.
" Nitrate	$Fe(NO_3)_2,6H_2O$	288	v. s.	dec.	dec.
" Oxalate (Ferric)	$Fe_2(C_2O_4)_3$	376	s.	s.	n. s.
" " (Ferrous)	FeC_2O_4	144	in potassium oxal.		n. s.
" Sulphate (Ferric)	$Fe_2(SO_4)_3$	400	s.	dec.	s.
" " (Ferrous)	$FeSO_4,7H_2O$	278	1.5	1	n. s.
Kaoline	$H_2Al_2Si_2O_8+H_2O$	258.8	not soluble.		
Lead, Acetate (see Sugar of Lead)	$Pb(C_2H_3O_2)_2,3H_2O$	378	2.5	2	1 in 12.5
" Carbonate	$PbCO_4$	366	n. s.	sp. s.	n. s.
" Iodide	PbI_2	460	s.	s.	n. s.
" Nitrate	$Pb(NO_3)_2$	330	7.7	7	s.
" Oxide	PbO	222.4	n. s.	n. s.	Alkalis.
Lithium, Bromide	LiBr	87	.66	.5	v. s.
" Chloride	$LiCl+H_2O$	60.5	1.3	1	s.
" Iodide	LiI	134	.61	.5	s.
Magnesium, Bromide	$MgBr_2$	184	1	.75	s.

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Abbreviations.—s., soluble; v. s., very soluble: sp. s., sparingly soluble; n. s., not soluble; dec., decomposed; del., deliquescent.

Name.	Symbol.	Molecular Weight.	One Part is Soluble in Cold Water.	One Part is Soluble in Hot Water.	Alcohol.
Magnesuim, Chloride	$MgCl_2$	95	2	1.5	s.
" Iodide	MgI_2	246.3	1	.75	v. s.
" Sulphate (see Epsom Salt)	$MgSO_4,7H_2O$	246	1.3	1	sp. s.
Manganous Chloride	$MnCl_2+4H_2O$	198	s.	s.	n. s.
Mercury, Chloride (Mercuric) (see Corros. Subl.)	$HgCl_2$	271	19	3	5
" " (Mercurous) (see Calomel)	Hg_2Cl	235.5	n. s.	n. s.	n. s.
" Cyanide	$HgCy_2$	252	8	2	1 in 20
" Iodide (Mercuric)	HgI_2	454	sp. s.	sp. s.	sp. s.
" " (Mercurous)	Hg_2I	654	n. s.	n. s.	n. s.
Metol (Mono-methyl Para-amidometakresol)	$C_8H_{11}NO$	137	s.	s.	s.
Para-amidophenol	C_6H_7NO	109	sp. s.	s.	
Para-amidophenol Sodium	C_6H_6NaNO	131	easily soluble.		
Para-amidophenol Hydrochlorate	C_6H_7NOHCl	145.5	s.	s.	s.
Para-rosaniline (Triamido-phenyl-Carbinol)	$C_{19}H_{19}N_3O$	305			
Phenol (see Carbolic Acid)					
Platino-potassium Chloride or Chloro-platinite of Potassium	K_2PtCl_4	417.4	6.		s.
Platino sodium Chloride or Chloro-platinite of Sodium	Na_2PtCl_4	385.4	soluble.		
Platinum Chloride	$PtCl_4+5H_2O$	429.4		*	
Potassa (see Potassium Hydrate)					

* Real platinum-chloride is but little soluble in water; the article of commerce of that name answers to the formula $PtCl_4 2HCl+6H_2O$, and is of the atomic weight 520.4 (K. Schwier). It is easily soluble in water, probably in the proportion of 1:6.

Potassium, Aluminium Sulphate (see Alum)	$Al_2(SO_4)_3,K_2SO_4,24H_2O$	948	10	8	n. s.
" Bicarbonate	$KHCO_3$	100	3	2	n. s.
" Bichromate	$K_2Cr_2O_7$	295	10	7	n. s.
" Bromide	KBr	119	2	1	1 in 90
" Carbonate	$KO_2C_3+2H_2O$	174	.75	.5	n. s.
" Chlorate	$KClO_3$	122.5	16	2	n. s.
" Chloride	KCl	74.5	3	2	sp s.
" Chromic Sulph. (see Chrome Alum)	$Cr_2(SO_4)_3,K_2SO_4,24H_2O$	999	10	dec.	n. s.
" Citrate	$K_3C_6H_5O_7H_2O$	324 3	6.6	.3	n. s.
" Cyanide	KCy	65.1	1	.5	sp. s.
" Ferric Sulphate	$K_2SO_4,Fe_2(SO_4)_3,24H_2O$	100.6	s.	s.	n. s.
" Ferri-cyanide (see Red Prussiate)	$K_6Fe_2Cy_{12}$	658.6	2.5	1.2	n. s.
" Ferro-cyanide (see Yellow Pruss.)	K_4FeCy_6	368.4	3	1	n. s.
" Fluoride	$KFl+2H_2O$	94	v. s.	v. s.	v. s.
" Hydrate	KOH	56	.5	.25	sp. s.
" Iodide	KI	166	.75	.5	1 in 16
" Nitrate (see Saltpetre)	KNO_3	101	4	1	n. s.
" Oxalate	$KC_2O_4H_2O$	235	3	2	sp. s.
" Permanganate	$KMnO_4$	158	16	10	n. s.
" Sulpho-cyanate	KCyS	97	2	1	sp. s.
Pyrogallo. (see Pyrogallic Acid)					
Rhodan (German appellation for Cyanates)					
Rodinal (ready-prepared Para-amido Developer)					
Silver, Acetate	$AgC_2H_3O^2$	167	sp. s.	sp. s.	n. s.
" Bromide	AgBr	188	n. s.	n. s.	in HCl and HBr.
" Carbonate	Ag_2CO_3	276	n. s.	n. s.	n. s.
" Chloride	AgCl	143.5	n. s.	n. s.	Ammonia, cyan. potass. hyposulphite of soda.
" Citrate	$Ag_3C_6H_5O_7$	513	sp. s.	sp. s.	
" Fluoride	AgFl	127	v. s.	v. s.	v. s.
" Iodide	AgI	235	n. s.	n. s.	same as Chloride.
" Nitrate	$AgNO_3$	170	1	.5	sp. s.

TABLE OF SYMBOLS, ATOMIC WEIGHT AND SOLUBILITIES OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY.

Abbreviations.—s., soluble; v. s., very soluble; sp. s., sparingly soluble; n. s., not soluble; dec., decomposed; del , deliquescent.

Name.	Symbol.	Molecular Weight.	One Part is Soluble in Cold Water.	One Part is Soluble in Hot Water.	Alcohol.
Silver, Nitrite	$AgNO_2$	154	300	dec.	n. s.
" Oxalate	$Ag_2C_2O_4$	304	sp. s.	s.	n. s.
" Oxide	Ag_2O	232	n. s.	n. s.	n. s.
" Sulphide	Ag_2S	248	n. s.	n. s.	n. s.
Soda, Caustic (see Sodium Hydrate)					
Sodium Acetate	$NaC_2H_3O_2,6H_2O$	190	3	.66	n. s.
" Biborate (Borax)	$Na_2B_4O_7,10H_2O$	382	12.5	2	n. s.
" Bromide	$NaBr$	103	1.25	1	1:16
" Bicarbonate	$NaHCO_3$	84	12	dec.	n. s.
" Carbonate	$Na_2CO_3,10H_2O$	286	2	1	n. s.
" Chloride	$NaCl$	58.5	2.75	2.75	n. s.
" Citrate	$Na_3C_6H_5O_7$	258	1	.5	sp. s.
" Hydrate	$NaHO$	40	1.5	.5	sp. s.
" Hypo-sulphite	$Na_2S_2O_35H_2O$	248	1.5	1	sp. s.
" Iodide	NaI	150	.5	.3	sp. s.
" Nitrate	$NaNO_3$	85	1.36	1	1 in 37
" Sulph-antimoniate or Schlippe's Salt	$NaSbS_3$	241	s.	s.	n. s.
" Sulphate	$Na_2SO_4,10H_2O$	322	2	4	s.
" Sulphide	$Na_2S,9H_2O$	240	s.	s.	sp. s.
" Sulphite	$Na_2SO_3,7H_2O$	252	4	2	sp. s.
" Tungstate	$Na_2WO_4+2H_2O$	326	s.	s.	n. s.
" Thio-sulphate (see Hypo-sulphite)					
Strontium, Bromide	$SrBr_2,6H_2O$	355.5	1	.75	sp. s.
" Chloride	$SrCl_2,6H_2O$	266.5	1.8	1	sp. s.

Strontium, Nitrate	$Sr(NO_3)_2$	211.5	5	2	sp. s.
Sugar of Lead (see Lead Acetate).					
Tannin (see Digallic Acid)					
Thymol	$C_6H_3(CH_3(C_3H_7)COO$	177	sp.		and in ether.
Tin, Chloride (Stannic)	$SnCl_4$	260	dec.	in much	water.
" Chloride (Stannous)	$SnCl_2,2H_2O$	225	135:100	655:100	v. s.
Uranium, Bromide	$UBr_2,4H_2O$	352	1	.5	sp. s.
" Nitrate	$UO_2(NO_3)_2.6H_2O$	384	.5	.25	v. s.
" Sulphate	$UO_2(SO_4),3H_2O$	302	.5	.25	v. s.
Verdigris (see Copper Acetate).					
Vitriol, Blue (see Copper Sulphate)					
" Green (see Iron Sulphate)					
" White (see Zinc Sulphate)					
Water	H_2O	18			
Washing Soda (see Sodium Carbonate)					
Wood Alcohol (see Alcohol Methyl)					
Zinc, Bromide	$ZnBr_2$	225	del.	and e. s.	s.
" Chloride	$ZnCl_2$	136	.33		s.
" Iodide	ZnI_2	319	.33	dec.	v. s.
" Nitrate	$Zn(NO_3)_2,6H_2O$	296	del.	del.	del.
" Sulphate (see White Vitriol)	$ZnSO_4,7H_2O$	287	2.	1.	n. s.
Zircon Earth	Z_1O_2	121.6	n. s.	n. s.	n. s.

IMPURITIES IN PHOTOGRAPHIC CHEMICALS AND TESTS FOR THEM.

Substance.	Impurities Possibly Present.	Tests.
Ammonia	Carbonic Acid.	Renders lime-water milky.
	Dissolved solid matter	Residue left on evaporation.
	Chlorides.	After acidulating with nitric acid, it gives a precipitate with silver nitrate, which, after washing, is readily soluble in ammonia, and re-precipitated by nitric acid.
	Sulphates.	After acidulating with nitric acid, it gives a precipitate with barium nitrate.
	Lime.	A white precipitate with oxalate of ammonium.
	Lead is often present, derived from the action upon flint glass bottles.	Black precipitate with sulphuretted hydrogen.
Nitric Acid	Traces of sulphuric acid.	After dilution it gives a precipitate with barium nitrate.
	Chlorides.	After dilution it gives a precipitate with silver nitrate.
	Peroxide of nitrogen.	The acid is yellow.
	Iodine may be present if the acid be prepared from sodium nitrate.	After dilution and cooling it gives a blue color with starch paste or mucilage.
Hydrochloric Acid	Free chlorine.	Liberates iodine from solution of potassium iodide. See also chlorides, nitric acid.
	Sulphuric acid.	As above for nitric acid.
	Perchloride of iron.	Yellow color. Brown precipitate with ammonia added till it smells slightly.
Hydrochloric Acid	Arsenic.	Marsh's test.
	Some yellow samples contain no iron, but an organic salt, and give an alkaline ash on ignition of the residue after evaporation.	Reinsh's test; a small piece of copper foil becomes coated on boiling in dilute acid.
Sulphuric Acid	Bisulphate of potassium.	Residue on evaporation.
	Sulphate of lead.	Milkiness on dilution. May be completely freed from lead by diluting with three or four times as much water, and allowing to settle.
	When sold as pure, it invariably contains a trace of iron. Common acid is also liable to contain arsenic, selenium, thallium, and many other substances.	No easy test can be given, as the substances are so numerous; some of them volatile, and most require separation from the acid before detection.
	Organic matter, as a piece of straw in a carboy of acid.	Gives a brown color to the acid.
Acetic Acid	Water.	Does not solidify when cooled to 17° C. (53° F.)
	Sulphurous and hydrochloric acids.	White precipitate with silver nitrate.
	Aldehyde, or volatile tarry matter.	Blackens in the light after adding silver nitrate.
	Organic sulphuric acid.	Smell of garlic.
Citric Acid	Tartaric acid.	Strong solution of potassium acetate added to a strong solution of the acid will deposit white crystalline bitartrate.
Pyrogallic Acid	Metagallic acid.	Black residue insoluble in water.
Silver Nitrate	Free nitric acid.	Reddens litmus paper (neutral silver nitrate does not affect litmus).
Potassium Carbonate	Chlorides and sulphates.	Same as for ammonia.
Potassium Iodide	Potassium carbonate.	A strong solution is alkaline to test paper.
	Sulphates and chlorides.	Same as for ammonia.
	Potassium iodate.	A pretty strong solution becomes yellow from liberation of iodine on addition of dilute sulphuric acid, or better, a strong solution of citric acid.

IMPURITIES IN PHOTOGRAPHIC CHEMICALS AND TESTS FOR THEM.—*Continued.*

Substance.	Impurities Possibly Present.	Test.
Potassium Bromide	Similar to potassium iodide.	See potassium iodide.
Sodium Carbonate	Chlorides and sulphates.	Same as for ammonia.
Sodium Chloride	Chloride of calcium.	Oxalate of ammonium (after addition of a little acetic acid) gives a milkiness or precipitate, indicating calcium; filter this out, and add ammonia, chloride of ammonium, and phosphate of sodium (clear solutions). A precipitate indicates magnesium. Both the above cause dampness in wet weather.
	Chloride of magnesium.	
	Sodium sulphate.	As for sulphates in ammonia.
Potassium Cyanide	Potassium carbonate nearly always present.	Effervescence with dilute acids, giving off a gas carbonic anhydride, which renders lime water turbid.
Potassium Hydrate		
Kaolin	Chalk.	Effervescence with dilute acids.
Water	Sulphates and chlorides.	Same as for ammonia.
	Calcium carbonate, temporary hardness.	Deposited by boiling.
	Ammonia, almost always present in distilled and rain water.	Test as for calcium chloride, see sodium chloride.
		Brown coloration, or precipitate with Nessler's re-agent.
Gelatine	Alum.	Ash, sometimes as much as 10 per cent.
	Fatty matter.	Separated by precipitation with alcohol. Dissolved out by ether or benzine, and left as a residue on evaporation of the solvent.
Ammonium Bromide	Potassium bromide, or other non-volatile bodies.	Leaves a residue when heated.
	Ammonium chloride.	Same as for chlorides in ammonia.
Pyrogallic Acid	Powdered glass.	Left behind on solution.
Potassium Iodide	Potassium bromide.	The crystals of bromide are usually more transparent than those of iodide, but no reliance can be placed on this.
Silver Nitrate	Potassium nitrate, sometimes present in the fused sticks, not in the crystals.	Will not yield the full quantity of chloride on precipitation with HCl. Gives a purple color to flame.
Calcium Chloride	Calcium hydrate.	The clear filtered solution made with distilled water is alkaline to test paper, and gives a precipitate on breathing into it through a tube.
Pure Chemicals generally.	Broken glass, bits of straw, wood, paper, &c.	These impurities either float or sink on the solution, and may easily be seen.

PERCENTAGE OF REAL AMMONIA IN SOLUTIONS OF DIFFERENT DENSITIES AT 14° CENTIGRAD.—CARIUS.

Specific Gravity.	Percent'ge Ammonia.	Specific Gravity.	Percent'ge Ammonia.	Specific Gravity.	Percent'ge Ammonia.	Specific Gravity.	Percent'ge Ammonia.
0.8844	36.0	0.9052	27.0	0.9314	18.0	0.9631	9.0
0.8864	35.0	0.9078	26.0	0.9347	17.0	0.9670	8.0
0.8885	34.0	0.9106	25.0	0.9380	16.0	0.9709	7.0
0.8907	33.0	0.9133	24.0	0.9414	15.0	0.9749	6.0
0.8929	32.0	0.9162	23.0	0.9449	14.0	0.9790	5.0
0.8953	31.0	0 9191	22.0	0.9484	13.0	0.9831	4.0
0.8976	30.0	0.9221	21.0	0.9520	12.0	0.9873	3.0
0.9001	29.0	0.9251	20.0	0.9556	11.0	0.9915	2.0
0.9026	28.0	0.9283	19.0	0.9593	10.0	0.9959	1.0

SOLUBILITY OF THE SILVER HALOIDS. By E. Valenta.

In the *Photographic Society's Journal* the following table, the result of a series of experiments, is given.

Solvent.	Concentration.	100 g. of solution can dissolve in grammes.			Remarks.
		Ag Cl.	Ag Br.	Ag I.	
Sodium hyposulphite	1 : 100	0.40	0.35	0.03	
" "	5 : 100	2.00	1.90	0.15	
" "	10 : 100	4.10	3.50	0.30	The estimations were made at 20° C.
" "	15 : 100	5.50	4.20	0.40	
" "	20 : 100	6.10	5.80	0.60	
Ammonium hyposulphite	1 : 100	0 57			For bromide and iodide of silver similar results were obtained as with sodium hyposulphite.
" "	5 : 100	1.32			
" "	10 : 100	3.92			
Sodium sulphite	10 : 100	0.44	0.04	0.01	
" "	20 : 100	0.95	0.08	0.02	
Ammonium sulphite	10 : 100		traces		
Ammonium carbonate	10 : 100	0.05			
Ammonia	3%	1.40			
"	15%	7.58			
Magnesium chloride	50 : 100	0.50	...	...	
Potassium cyanide	5 : 100	2.75	6.55	8.23	25° C.
Ammonium sulphocyanide	5 : 100	0.08	0.21	0.02	
" "	10 : 100	0.54	2.04	0.08	23° C.
" "	15 : 100	2.88	5.30	0.13	
Potassium sulphocyanide	10 : 100	0.11	0.73		25° C.
Calcium sulphocyanide	10 : 100	0.15	0.53	0.03	
Barium sulphocyanide	10 : 100	0.20	0.35	0.02	
Aluminium sulphocyanide	10 : 100	2.02	4.50	0.02	
Thiocarbamide	10 : 100	0.83	1.87	0.79	25° C.
Thiosinamin	1 : 100	0.40	0.08	0.008	
"	5 : 100	1.90	0.35	0.05	
"	10 : 100	3.90	0.72	0.09	

TABLE OF EQUIVALENT QUANTITIES OF SOME HALOIDS USED IN PHOTOGRAPHY.

CALCULATED FOR THE ANHYDROUS AND DRY SALTS.

By A. B. AUBERT, Professor of Chemistry, Maine State College, Orono, Me.

†EQUIVALENT QUANTITIES OF VARIOUS CHLORIDES USED IN PHOTOGRAPHY.

Sodium Chloride.	Potassium Chloride.	Ammonium Chloride.	Lithium Chloride.	Cadmium Chloride.
1	1.275	0.914	0.726	1.564
0.784	1	0.717	0.569	1.226
1.093	1.394	1	0.794	1.710
1.376	1.755	1.258	1	2.152
0.639	0 818	0.584	0.464	1

†EQUIVALENT QUANTITIES OF VARIOUS BROMIDES USED IN PHOTOGRAPHY.

Bromine.	Ammonium Bromide.	Potassium Bromide.	Sodium Bromide.	Cadmium Bromide + 4 Equi. Water.	Zinc Bromide.
1	1.225	1.488	1.287	2.150	1.406
0.816	1	1.214	1.055	1.754	1.147
0.672	0.823	1	0.865	1.445	0.945
0.777	0.952	1.156	1	1.671	1.092
0.465	0.570	0.692	0.599	1	0.654
0.711	0.871	1 058	0.915	1.529	1

†EQUIVALENT QUANTITIES OF VARIOUS IODIDES USED IN PHOTOGRAPHY.

Iodine.	Ammonium Iodide.	Potassium Iodide.	Sodium Iodide.	Cadmium Iodide.	Zinc Iodide.
1	1.142	1.307	1.181	1.441	1.255
0.876	1	1.145	1.035	1.262	1.099
0.765	0.874	1	0.903	1.102	0.960
0.847	0.967	1.107	1	1.220	1.063
0.694	0.793	0.907	0.820	1	0.871
0.797	0.910	1.042	0.941	1.148	1

†EQUIVALENT QUANTITIES OF VARIOUS SILVER SALTS USED IN PHOTOGRAPHY.

Silver (Metallic).	Nitrate.	Chloride.	Bromide.	Iodide.
1	1.574	1.328	1.741	2.176
0.6353	1	0.844	1.106	1.382
0.7523	1.184	1	1.310	1.638
0.5744	0.904	0.763	1	1.250
0.4595	0.723	0.610	0.800	1

†EQUIVALENT QUANTITES OF VARIOUS GOLD SALTS USED IN PHOTOGRAPHY.

Gold (Metallic).	Chloride.	Double Chloride of Gold and Potassium.	Double Chloride of Gold and Sodium.
1	1.542	2.1048	2.0229
0.6485	1	1.3645	1.3119
0.4751	0.7326	1	0.9611
0.4943	0.7623	1.0405	1

† Translated and partly recalculated from the "Agenda du Chimiste."

ACKLAND'S TABLES FOR THE SIMPLIFICATION OF EMULSION CALCULATIONS.

No. 1.

	Equivalent weights.	Weight of $AgNO_3$ required to convert one grain of soluble haloid.	Weight of soluble haloid required to convert one grain $AgNO_3$.	Weight of silver haloid produced by one grain of soluble haloid.	Weight of soluble haloid required to produce one grain of silver haloid.	Weight of silver haloid produced from one grain $AgNO_3$.	
Ammonium bromide.....	98	1.734	.576	1.918	.521		
Potassium "	119.1	1.427	.700	1.578	.633		
Sodium "	103	1.650	.606	1.825	.548		1.106
Cadmium " com..	172	.988	1.012	1.093	.915		
" " anh....	136	1.25	.800	1.382	.723		
Zinc "	112.1	1.509	.663	1.670	.600		
Ammonium chloride.....	53.5	3.177	.315	2.682	.373		.844
Sodium "	58.5	2.906	.344	2.453	.408		
Ammonium iodide.....	145	1.172	.853	1.620	.617		
Potassium "	166.1	1.023	.977	1.415	.707		1.382
Sodium "	150	1.133	.882	1.566	.638		
Cadmium "	183	.929	1.076	1.284	.778		

Table No. 1 presents the actual weights of haloid or silver, as the case may be, required to convert or combine with one grain of another.

In order to make (say) ten ounces of emulsion by a new formula, which, for the sake of showing the working of the table, we will write down as follows:

Bromide of potassium.....	150 grains.
Iodide of potassium.....	10 "
Chloride of ammonium.....	10 "
Gelatine.....	200 "

we want to know how much silver nitrate should be employed in sensitizing this mixture. For this purpose we use the first column, in which we find against each haloid the exact quantity of silver nitrate required to fully decompose one grain. Taking, then, the figures we find in column No. 1 against the three salts in the above formula, and multiplying them by the number of grains of each used, we have the following sum:

Potassium bromide.....	$150 \times 1.427 = 214$	Weight
" iodide.....	$10 \times 1.023 = 10.23$	silver nitrate
Chloride of ammonium.....	$10 \times 3.177 = 31.77$	required.

or the total quantity of silver nitrate required for full conversion, 256.00 grains.



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"NATURE'S MIRROR."

By A. MORENO.

ACKLAND'S TABLES FOR THE SIMPLIFICATION OF EMULSION CALCULATIONS.

No. 2.

	Ammonium bromide.	Potassium bromide.	Sodium bromide.	Cadmium bromide. (Coml.)	Cadmium bromide. (Anhyd.)	Zinc bromide.	Ammonium chloride.	Sodium chloride.	Ammonium iodide.	Potassium iodide.	Sodium iodide.	Cadmium iodide.
Ammonium bromide	**1**	.823	.951	.57	.72	.87	1.832	1.675	.676	.59	.653	.535
Potassium "	1.215	**1**	1.156	.692	.876	1.058	2.226	2.036	.821	.717	.794	.651
Sodium "	1.051	.865	**1**	.599	.757	.915	1.925	1.761	.71	.62	.686	.563
Cadmium " com.	1.755	1.444	1.67	**1**	1.265	1.527	3.215	2.94	1.186	1.035	1.146	.94
" " anh.	1.387	1.141	1.32	.79	**1**	1.207	2.542	2.324	.938	.819	.906	.743
Zinc "	**1.149**	.945	1.093	.655	.828	**1**	2.104	1.925	.776	.678	.75	.615
Ammonium chloride.....	.546	.449	.519	.311	.393	.475	**1**	.914	.369	.322	356	.292
Sodium "	.597	.491	.568	.34	.43	.519	1.093	**1**	.403	.352	.39	.319
Ammonium iodide	1.479	1.217	1.408	.843	1.066	1.287	2.712	2.478	**1**	.873	.966	.792
Potassium "	1.695	1.394	1.612	.965	1.221	1.475	3.104	2.839	1.145	**1**	1.107	.907
Sodium "	1.53	1.259	1.456	.872	1.103	1.332	2.803	2.564	1.034	.903	**1**	.819
Cadmium "	1.867	1.536	1.776	1.064	1.345	1.625	3.42	3.128	1.262	1.102	1.22	**1**

TABLE No. 2 gives in separate columns the relative converting values of each of the soluble haloid salts in ordinary use, showing how much of any salt must be used to replace one grain of any other. In each column will be found a unit (printed in larger type) which represents one grain of the salt named at the head of the column; the other figures in the same column show the exact quantities of the other salts which must be used in lieu of a single grain of that particular haloid. Thus, taking the first column, which is headed "Ammonium Bromide," we find against ammonium bromide in the margin the figure 1, representing one grain of that salt. If we wish to know the relative converting power of potassium bromide we take the number in the same column which stands against the latter salt in the margin, viz., 1.215; that is to say, 1.215 grain of potassium bromide will be required to do the same work as one of NH_4 Br.

TABLE OF THE RELATIVE SOLUBILITY OF THE CHLORID, BROMID AND IODID OF SILVER.

From Comptes Rendus des Séances de l' Academie des Sciences de Vienne. E. VALENTA. Translated by D. W. COLBY, Maine State College, Orono.

SOLVENT.	CONCENTRATION.	100 GRAMMES OF SOLUTION DISSOLVE IN GRMS.			REMARKS.
		Ag Cl	Ag Br	Ag I	
Sodium Thiosulfite.	1:100	0.40	0.35	0.03	The determinations of solubility were made at 20 deg. C.
....	5:100	2.00	1.90	0.15	
.... ...	10:100	4.10	3.50	0.30	
....	15:100	5.50	4.20	0.40	
....	20:100	6 10	5.80	0.60	
Ammonium Thiosulfite.	1:100	0.57			The bromid and iodid of silver dissolve as in sodium thiosulfite.
....	5:100	1.32			
....	10:100	3.92			
Sodium Sulfite.	10:100	0.44	0.04	0.01	at 25 deg. C.
....	20:100	0.05	0.08	0 02	
Ammonium Sulfite.	10:100	traces	traces	traces	
Ammonium Carbonate.	10:100	0.05			
Ammonia.	3 per ct.	1.40			
....	15 per ct.	7 58			
Magnesium Chlorid.	50:100	0.50			
Potassium Cyanid.	5:100	2.75	6.55	8.23	at 25 deg. C.
Ammonium Sulfocyanid.	5:100	0.08	0.21	0.02	at 20 deg. C.
.... . ..	10:100	0.54	2.04	0.08	
....	15:100	2.88	5.30	0.13	
Potassium Sulfocyanid.	10:100	0.11	0.73		at 25 deg. C.
Calcium Sulfocyanid.	10:100	0.15	0.53	0.03	
Barium Sulfocyanid.	10:100	0.20	0.35	0 02	
Aluminum Sulfocyanid.	10:100	2.02	4.50	0.02	
Thiocarbamide.	10:100	0.83	1.87	0.79	at 25 deg. C.
Thiosinnamine.	1:100	0.40	0.08	0.08	
....	5:100	1.90	0.35	0.05	
....	10:100	3.90	0.72	0.09	

On looking over these figures one sees immediately, that the chemical equations representing the solution of the haloid salts of silver, do not accord with the facts. The solution of silver chlorid, for example, in sodium thiosulfite should take place after the following equation:

$$Na_2S_2O_3 + 2AgCl = Ag_2S_2O_3 + NaCl$$

The figures given by experiment are not exactly in concordance with the equation. Furthermore in replacing in that formula AgCl by AgBr or AgI we find a still more marked difference, for by the table the silver iodid is nearly ten times less soluble than the chlorid or bromid.

The most energetic solvent for the silver salts is without doubt the cyanid of potassium. This dissolves with great readiness the chlorid, bromid and iodid of silver. In this case also theory does not accord with practice. The solution in cyanid takes place after the following equation:

$$KCy + AgCl\,(Br \text{ or } I) = AgCy + KCl\,(Br \text{ or } I)$$

The cyanid of potassium acts in a different manner from the sodium thiosulfite. In the thiosulfite the solubility is greatest in the chlorid, diminishing to the iodid; on the contrary for the cyanid it is least for the chlorid, increasing to the iodid.

Following from this it is best to use the potassium cyanid as a fixing agent in case any great amount of the iodid of silver is present.

ELSDEN'S TABLE OF POISONS AND ANTIDOTES.

	Poisons.	Remarks.	Characteristic Symptoms.	Antidote.
Caustic Vegetable Alkalies.	Oxalic Acid. including Potassium Oxalate.	1 dram is the smallest fatal dose known.	Hot, burning sensation in throat and stomach; vomiting, cramps, and numbness.	Chalk, whiting or magnesia, suspended in water. Plaster or mortar can be used in emergency.
	Ammonia. Potash. Soda.	Vapor of ammonia may cause inflammation of the lungs.	Swelling of tongue, mouth, and fauces; often followed by stricture of the œsophagus.	Vinegar and water.
Metallic Salts.	Mercuric Chloride.	3 grains the smallest known fatal dose.	Acrid, metallic taste, constriction and burning in throat and stomach, followed by nausea and vomiting.	White and yolk of raw eggs with milk. In emergency, flour paste may be used.
	Acetate of Lead.	The sub-acetate is still more poisonous.	Constriction in the throat and at pit of stomach; crampy pains and stiffness of abdomen; blue line round the gums.	Sulphates of soda or magnesia. Emetic of sulphate of zinc.
	Cyanide of Potassium.	*a.* Taken internally, 3 grs. fatal.	Insensibility, slow, gasping respiration, dilated pupils, and spasmodic closure of the jaws.	No certain remedy; cold affusion over the head and neck most efficacious.
		b. Applied to wounds and abrasures of the skin.	Smarting sensation.	Sulphate of iron should be applied immediately.
	Bichromate of Potassium	*a.* Taken internally.	Irritant pain in stomach, and vomiting.	Emetics and magnesia, or chalk.
		b. Applied to slight abrasions of the skin.	Produces troublesome sores and ulcers.	
	Nitrate of Silver.		Powerful irritant.	Common salt to be given immediately, followed by emetics.
Concentrated Mineral Acids.	Nitric Acid.	2 drams have been fatal. Inhalation of the fumes has also been fatal.	Corrosion of windpipe and violent inflammation.	Bicarbonate of soda, or carbonate of magnesia or chalk, plaster of the apartment beaten up in water.
	Hydrochloric Acid.	½ ounce has caused death.		
	Sulphuric Acid.	1 dram has been fatal.		
	Acetic Acid, concentrated, has as powerful an effect as the mineral acids.			
	Iodine.	Variable in its action; 3 grains have been fatal.	Acrid taste, tightness about the throat, vomiting.	Vomiting should be encouraged, and gruel, arrowroot and starch given freely.
	Ether.	When inhaled.	Effects similar to chloroform.	Cold affusion and artificial respiration.
	Pyrogallol.	2 grains sufficient to kill a dog.	Resemble phosphorus poisoning.	No certain remedy. Speedy emetic desirable.

UNITED STATES WEIGHTS AND MEASURES.

ACCORDING TO EXISTING STANDARDS.

LINEAL.

	Inches.	Feet.	Yards.	Rods.	Fur's.	Mile.
12 inches = 1 foot.	12 =	1				
3 feet = 1 yard.	36 =	3 =	1			
5.5 yards = 1 rod.	198 =	16.5 =	5.5 =	1		
40 rods = 1 furlong.	7,920 =	660 =	220 =	40 =	1	
8 furlongs = 1 mile.	63,360 =	5,280 =	1,760 =	320 =	8 =	1

SURFACE—LAND.

	Feet.	Yards.	Rods.	Roods.	Acres.
144 sq. ins. = 1 sq. ft.	9 =	1			
9 sq. ft. = 1 sq. yard.	272.25 =	30.25 =	1		
30.25 sq. yds. = 1 sq. rod.	10,890 =	1,210 =	40 =	1	
40 sq. rods = 1 sq. rood.	43,560 =	4,840 =	160 =	4 =	1
4 sq. roods = 1 acre.	27,878,400 =	3,097,600 =	102,400 =	2,560 =	640
640 acres = 1 sq. mile.					

VOLUME—LIQUID.

	Gills.	Pints.	Gallon.	Cub. In.
4 gills = 1 pint.	32 =	8 =	1 =	231
2 pints = 1 quart.				
4 quarts = 1 gallon.				

FLUID.

Gallon.	Pints.	Ounces.	Drachms.	Minims.	Cubic Centimetres.
1 =	8 =	128 =	1,024 =	61,440 =	3,785,435
	1 =	16 =	128 =	7,680 =	473,179
		1 =	8 =	480 =	29,574
			1 =	60 =	3,697

16 ounces, or a pint, is sometimes called a fluid pound.

TROY WEIGHT.

Pound.	Ounces.	Pennyweights.	Grains.	Grams.
1 =	12 =	240 =	5,760 =	373.24
	1 =	20 =	480 =	31.10
		1 =	24 =	1.56

APOTHECARIES' WEIGHT.

lb.	℥	ʒ	℈	gr.	
Pound.	Ounces.	Drachms.	Scruples.	Grains.	Grams.
1 =	12 =	96 =	288 =	5,760 =	373.24
	1 =	8 =	24 =	480 =	31.10
		1 =	3 =	60 =	3.89
			1 =	20 =	1.30
				1 =	.06

The pound, ounce, and grain are the same as in Troy weight.

AVOIRDUPOIS WEIGHT.

Pound.	Ounces.	Drachms.	Grains (Troy).	Grams.
1 =	16 =	256 =	7,000 =	453.60
	1 =	16 =	437.5 =	28.35
		1 =	27.34 =	1.77

ENGLISH WEIGHTS AND MEASURES.

APOTHECARIES' WEIGHT.

20 Grains = 1 Scruple = 20 Grains.
3 Scruples = 1 Drachm = 60 Grains.
8 Drachms = 1 Ounce = 480 Grains.
12 Ounces = 1 Pound = 5760 Grains.

FLUID MEASURE.

60 Minims = 1 Fluid Drachm
8 Drachms= 1 Fluid Ounce.
20 Ounces = 1 Pint.
8 Pints = 1 Gallon.

The above weights are usually adopted in formulas.

All Chemicals are usually sold by

AVOIRDUPOIS WEIGHT.

$27\frac{11}{32}$ Grains = 1 Drachm= $27\frac{11}{32}$ Grains.
16 Drachms= 1 Ounce = $437\frac{1}{2}$ Grains.
16 Ounces = 1 Pound = 7000 Grains.

Precious Metals are usually sold by

TROY WEIGHT.

24 Grains = 1 Pennyweight = 24 Grains.
20 Pennyweights = 1 Ounce = 480 Grains.
12 Ounces = 1 Pound = 5760 Grains.

NOTE.—An ounce of metallic silver contains 480 grains, but an ounce of nitrate of silver contains only $437\frac{1}{2}$ grains.

UNITED STATES FLUID MEASURE.

Gal.	Pints.	Ounces.	Drachms.	Mins.	Cub. In.	Grains.	Cub. C.M.
1 =	8 =	128 =	1,024 =	61,440 =	231. =	58,328.886 =	3,785.44
	1 =	16 =	128 =	7,680 =	28.875 =	7,291.1107 =	473.18
		1 =	8 =	480 =	1.8047 =	455.6944 =	29.57
			1 =	60 =	0.2256 =	56.9618 =	3.70

IMPERIAL BRITISH FLUID MEASURE.

Gal.	Pints.	Ounces.	Drachms.	Mins.	Cub. In.	Grains.	Cub. C.M.
1 =	8 =	160 =	1,280 =	76,800 =	277.27384 =	70,000 =	4,543.732
	1 =	20 =	160 =	9,600 =	34.65923 =	8,750 =	567.966
		1 =	8 =	480 =	1.73296 =	437.5 =	28.398
			1 =	60 =	0.21662 =	54.69 =	3.550

METRIC SYSTEM OF WEIGHTS AND MEASURES.

MEASURES OF LENGTH.

Denominations and Values.		Equivalents in Use.	
Myriameter	10,000 meters.	6.2137	miles.
Kilometer	1,000 meters.	.62137	mile, or 3,280 ft. 10 in.
Hectometer	100 meters.	328.	feet and 1 inch.
Dekameter	10 meters.	393.7	inches.
Meter	1 meter.	39.37	inches.
Decimeter	1-10th of a meter.	3.937	inches.
Centimeter	1-100th of a meter.	.3937	inch.
Millimeter	1-1000th of a meter.	.0394	inch.

MEASURES OF SURFACE.

Denominations and Values.		Equivalents in Use.	
Hectare	10,000 square meters.	2.471	acres.
Are	100 square meters.	119.6	square yards.
Centare	1 square meter.	1,550.	square inches.

MEASURES OF VOLUME.

Denominations and Values.			Equivalents in Use.	
Names.	No. of Liters.	Cubic Measures.	Dry Measure.	Wine Measure.
Kiloliter or stere	1,000	1 cubic meter.	1.308 cubic yards.	264.17 gallons.
Hectoliter	100	1-10th cubic meter.	2 bu. and 3.35 pecks.	26.417 gallons.
Dekaliter	10	10 cubic decimeters.	9.08 quarts.	2.6417 gallons.
Liter	1	1 cubic decimeter.	.908 quart.	1.0567 quarts.
Deciliter	1-10	1-10th cubic decimeter.	6.1023 cubic inches.	.845 gill.
Centiliter	1-100	10 cubic centimeters.	.6102 cubic inch.	.338 fluid oz.
Milliliter	1-1000	1 cubic centimeter.	.061 cubic inch.	.27 fl. drm.

WEIGHTS.

Denominations and Values.			Equivalents in Use.
Names.	Number of Grams.	Weight of Volume of Water at its Maximum Density.	Avoirdupois Weight.
Millier or Tonneau	1,000,000	1 cubic meter.	2204.6 pounds.
Quintal	100,000	1 hectoliter.	220.46 pounds.
Myriagram	10,000	10 liters.	22.046 pounds.
Kilogram or Kilo	1,000	1 liter.	2.2046 pounds.
Hectogram	100	1 deciliter.	3.5274 ounces.
Dekagram	10	10 cubic centimeters.	.3527 ounce.
Gram	1	1 cubic centimeter.	15.432 grains.
Decigram	1-10	1-10th of a cubic centimeter.	1.5432 grain.
Centigram	1-100	10 cubic millimeters.	.1543 grain.
Milligram	1-1000	1 cubic millimeter.	.0154 grain.

For measuring surfaces, the square dekameter is used under the term of ARE; the hectare, or 100 ares, is equal to about 2½ acres. *The unit of capacity* is the cubic decimeter or LITER, and the series of measures is formed in the same way as in the case of the table of lengths. The cubic meter is the unit of measure for solid bodies, and is termed STERE. *The unit of weight* is the GRAM, which is the weight of one cubic centimeter of pure water weighed in a vacuum at the temperature of 4 deg. Cent. or 39.2 deg. Fahr., which is about its temperature of maximum density. In practice, the term cubic centimeter, abbreviated c.c, is generally used instead of milliliter, and cubic meter instead of kiloliter.

METRIC SYSTEM OF WEIGHTS AND MEASURES.

THE meter is a measure of length equal to 39.370 English or American inches, a standard of linear measure supposed to be the ten-millionth part of the distance from the equator to the north pole, as ascertained by actual measurement of an arc of the meridian.

This system, formed on the meter as the unit of length, has four other leading units, all connected with and dependent upon this. Hence, we have:

1. The meter, which is the unit of measures of length.

2. The are, which is the unit of surface, and is the square of the meter.

3. The liter, which is the unit of measures of capacity, and is the cube of a tenth part of the meter.

4. The stere, which is the unit of measures of solidity, having the capacity of a cubic meter.

5. The gram, which is the unit of measures of weight, and is the weight of that quantity of distilled water at its maximum density, fills the cube of a hundredth part of the meter.

Each unit has its decimal multiples and sub-multiples, that is weights and measures ten times larger, or ten times smaller, than the principal units. The prefixes denoting multiples are derived from the Greek, and are: Deka, ten; hecto, hundred; kilo, thousand; and myria, ten thousand. Those denoting sub-multiples are taken from the Latin, and are: Deci, ten; centi, hundred (as in centigram or centimeter); and milli, thousand.

The metric system has been adopted by many nations, the English excepted. In America its use has been made optional, but is legalized by Congress. All photographic formulas received from the continent of Europe express values and quantities with metrical weights and measures. To utilize them directly without translating into the expressions of the English system, the student is advised to procure gram weights and cubic centimeter graduates, and substitute them for those denoting quantities according to the old plan.

As an assistance to those who cannot acquire these aids, we annex tables, which convert grams and cubic centimeters into English grains, drachms, and ounces sufficiently correct for practical purposes.

METRIC FLUID MEASURES.

The cubic centimeter, usually represented by "C.c.," is the unit of the metric measurement for liquids. It contains 17 minims of water. The weight of this quantity of water is 1 gram. The following table will prove to be sufficiently accurate for photographic purposes:

THE CONVERSION OF FRENCH (METRIC) INTO ENGLISH MEASURE.

1	cubic centimeter	=	17	minims.					
1	cubic centimeters	=	34	"					
3	"	=	51	"					
4	"	=	68	"	or 1	dram	8	minims.	
5	"	=	85	"	" 1	"	25	"	
6	"	=	101	"	" 1	"	41	"	
7	"	=	118	"	" 1	"	58	"	
8	"	=	135	"	" 2	drams	15	"	
9	"	=	152	"	" 2	"	32	"	
10	"	=	169	"	" 2	"	49	"	
20	"	=	338	"	" 5	"	38	"	
30	"	=	507	"	" 1	ounce	0 dram	27	minims
40	"	=	676	"	" 1	"	3 drams	16	"
50	"	=	845	"	" 1	"	6 "	5	"
60	"	=	1014	"	" 2	ounces	0 "	54	"
70	"	=	1183	"	" 2	"	3 "	43	"
80	"	=	1352	"	" 2	"	6 "	32	"
90	"	=	1521	"	" 3	"	1 "	21	"
100	"	=	1690	"	" 3	"	4 "	10	"
1000	"	= 1 liter = 34 fluid ounces nearly, or $2\frac{1}{8}$ pints.							

THE CONVERSION OF FRENCH (METRIC) INTO ENGLISH WEIGHT.

THE following table, which contains no error greater than one-tenth of a grain, will suffice for most practical purposes:

1	gram	=	$15\frac{2}{5}$	grains.				
2	grams	=	$30\frac{4}{5}$	"				
3	"	=	$46\frac{1}{5}$	"				
4	"	=	$61\frac{4}{5}$	"	 or	1 dram	$1\frac{4}{5}$	grain.
5	"	=	$77\frac{1}{5}$	"	 "	1 "	$17\frac{1}{5}$	grains.
6	"	=	$92\frac{3}{5}$	"	 "	1 "	$32\frac{3}{5}$	"
7	"	=	108	"	 "	1 "	48	"
8	"	=	$123\frac{2}{5}$	"	 "	2 drams	$3\frac{2}{5}$	"
9	"	=	$138\frac{4}{5}$	"	 "	2 "	$18\frac{4}{5}$	"
10	"	=	$154\frac{2}{5}$	"	 "	2 "	$34\frac{2}{5}$	"
11	"	=	$169\frac{4}{5}$	"	 "	2 "	$49\frac{4}{5}$	"
12	"	=	$185\frac{1}{5}$	"	 "	3 "	$5\frac{1}{5}$	"
13	"	=	$200\frac{3}{5}$	"	 "	3 "	$20\frac{3}{5}$	"
14	"	=	216	"	 "	3 "	36	"
15	"	=	$231\frac{2}{5}$	"	 "	3 "	$51\frac{2}{5}$	"
16	"	=	247	"	 "	4 "	7	"
17	"	=	$262\frac{3}{5}$	"	 "	4 "	$22\frac{3}{5}$	"
18	"	=	$277\frac{4}{5}$	"	 "	4 "	$37\frac{4}{5}$	"
19	"	=	$293\frac{1}{5}$	"	 "	4 "	$53\frac{1}{5}$	"
20	"	=	$308\frac{3}{5}$	"	 "	5 "	$8\frac{3}{5}$	"
30	"	=	463	"	 "	7 "	43	"
40	"	=	$617\frac{1}{5}$	"	 "	10 "	$17\frac{1}{5}$	"
50	"	=	$771\frac{3}{5}$	"	 "	12 "	$51\frac{3}{5}$	"
60	"	=	926	"	 "	15 "	26	"
70	"	=	$1080\frac{1}{5}$	"	 "	18 "	$0\frac{1}{5}$	"
80	"	=	$1234\frac{3}{5}$	"	 "	20 "	$34\frac{3}{5}$	"
90	"	=	1389	"	 "	23 "	9	"
100	"	=	$1543\frac{1}{5}$	"	 "	25 "	$43\frac{1}{5}$	"
1000	"	= 1 kilogram = 32 oz., 1 dr., $12\frac{3}{5}$ gr.						

THE CONVERSION OF METRIC INTO AMERICAN MEASURE.

By Nelson B. Sizer, B.Sc., M.D.

[From *The Photographic Times*, August 14, 1891.]

The following table is computed true to the nearest half grain or minim, as the case may be, so it will prove a sufficiently near approximation to the required metric equivalents.

U. S. P. Standard.

Gram, or c.cm.	Grains.	Minims.	Gram, or c.cm.	Grains.	Minims.
1	15½	16½	15	231½	244
2	31	32½	16	247	260
3	46	49	17	262	276
4	62	65	18	278	292½
5	77	81	19	293	309
6	93	97½	20	308½	325
7	108	114	30	463	487½
8	123½	130	40	617	650
9	139	146	50	771½	813
10	154	162½	60	926	975½
11	170	179	70	1,080	1,138
12	185	194	80	1;234½	1,300½
13	201	211	90	1,389	1,463
14	216	227½	100	1,543	1,625½
..			1,000	15,432⅓	16,256⅔
..		...		1 kilo.	liter.

The "kilo" or kilogram, the 1,000 gram weight, is equal to 32 ounces $72\frac{2}{10}$ grains "Troy or Apothecaries" weight, or 2 pounds 3 ounces $119\frac{7}{10}$ grains Avoirdupois.

The "liter" or 1,000 cubic centimeters, or bulk of water that weighs 1 kilo, is equal to 2 pints 1 fluid ounce and $415\frac{3}{10}$ minims, U. S. P. Standard, or our glass graduates as commonly sold by reliable houses.

The grains and minims are easily reduced to fluid drachms and fluid ounces, or drachms and ounces Troy, by my readers, if they will only remember that 60 grains or minims go to the solid or fluid drachm, and 480 grains or minims, or 8 drachms solid or fluid, go to each U. S. P. ounce, solid or fluid.

Thus the table gives the value of 90 grams as 1,389 grains, of 90 cubic centimeters as 1,463 minims. How many ounces in each?

Dividing 1,389 by 60 for drachms, we have 23 drachms 9 grains. As 8 drachms go to the ounce, there are 2 ounces in the 23 drachms and 7 drachms over, so we have—in 1,389 grains there are 2 ounces 7 drachms 9 grains. In the same way we find 3 fluid ounces and 23 minims over, to be the value of 90 cubic centimeters or 1,463 minims.

TABLE SHOWING THE COMPARISON OF THE READINGS OF THERMOMETERS.

CELSIUS, OR CENTIGRADE (C). RÉAUMUR (R). FAHRENHEIT (F).

C.	R.	F.	C.	R.	F.
—30	—24.0	—22.0	23	18.4	73.4
—25	—20.0	—13.0	24	19.2	75.2
—20	—16.0	— 4.0	25	20.0	77.0
—15	—12.0	+ 5 0	26	20.8	78.8
—10	— 8.0	14.0	27	21.6	80.6
— 5	— 4.0	23.0	28	22.4	82 4
— 4	— 3.2	24.8	29	23 2	84.2
— 3	— 2.4	26.6	30	24.0	86.0
— 2	— 1.6	28.4	31	24.8	87.8
— 1	— 0.8	30.2	32	25.6	89.6
			33	26.4	91.4
Freezing point of water.			34	27.2	93.2
			35	28.0	95.0
0	0.0	32.0	36	28.8	96.8
1	0.8	33.8	37	29.6	98.6
2	1.6	35.6	38	30.4	100.4
3	2.4	37.4	39	31.2	102.2
4	3.2	39.2	40	32.0	104.0
5	4.0	41.0	41	32.8	105.8
6	4.8	42.8	42	33.6	107.6
7	5.6	44.6	43	34.4	109.4
8	6.4	46.4	44	35.2	111.2
9	7.2	48.2	45	36.0	113.0
10	8.0	50.0	50	40.0	122.0
11	8.8	51.8	55	44.0	131.0
12	9.6	53.6	60	48.0	140.0
13	10.4	55.4	65	52.0	149.0
14	11.2	57.2	70	56.0	158.0
15	12.0	59.0	75	60.0	167.0
16	12.8	60.8	80	64.0	176.0
17	13.6	62.6	85	68.0	185.0
18	14.4	64.4	90	72.0	194.0
19	15.2	66.2	95	76.0	203.0
20	16.0	68.0	100	80.0	212.0
21	16.8	69.8			
22	17.6	71.6	Boiling point of water.		

Readings on one scale can be changed into another by the following formulæ, in which $t°$ indicates degrees of temperature:

Réau. to Fahr.

$$\frac{9}{4}t° \text{ R} + 32° = t° \text{ F}$$

Cent. to Fahr.

$$\frac{9}{5}t° \text{ C} + 32° = t° \text{ F}$$

Fahr. to Cent.

$$\frac{5}{9}\left(t° \text{ F} - 32°\right) = t° \text{ C}$$

Réau. to Cent.

$$\frac{5}{4}t° \text{ R} = t° \text{ C}$$

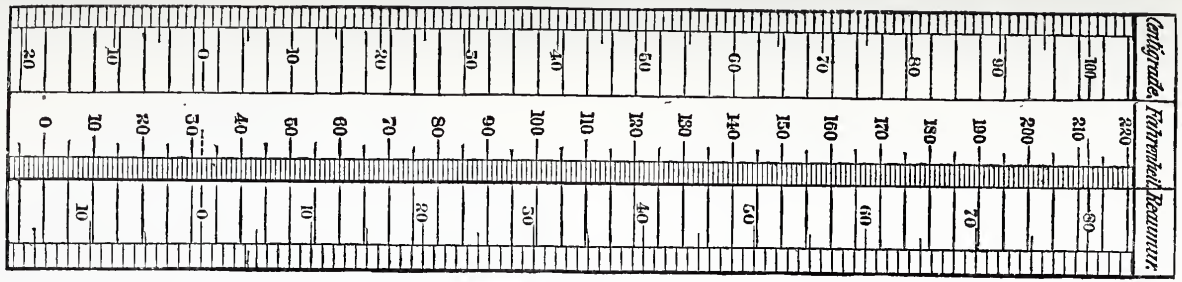
Cent. to Réau.

$$\frac{4}{5}t° \text{ C} = t° \text{ R}$$

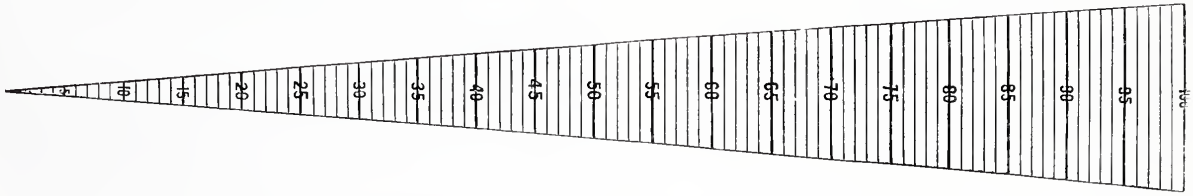
Fahr. to Réau.

$$\frac{4}{9}\left(t° \text{ F} - 32\right) = t° \text{ R}$$

THERMOMETER SCALES.



SCALE FOR MEASURING DIAMETERS OF STOPS FOR LENSES.



Each cross line varies in length from the adjacent one by $\frac{1}{100}$th of an inch.

To use: Lay the stop flat on this scale, and select the cross line which is of the same length as the greatest diameter of the opening; read this off, by means of the figures, which will be the measurements in $\frac{1}{100}$ths of an inch. The equivalent focal length of lens, divided by this measurement of the stop opening, will give the fraction expressing the ratio of aperture to focal length. The rapidity of different lenses, or of the same lens with different stops, is proportional to the squares of these ratios.

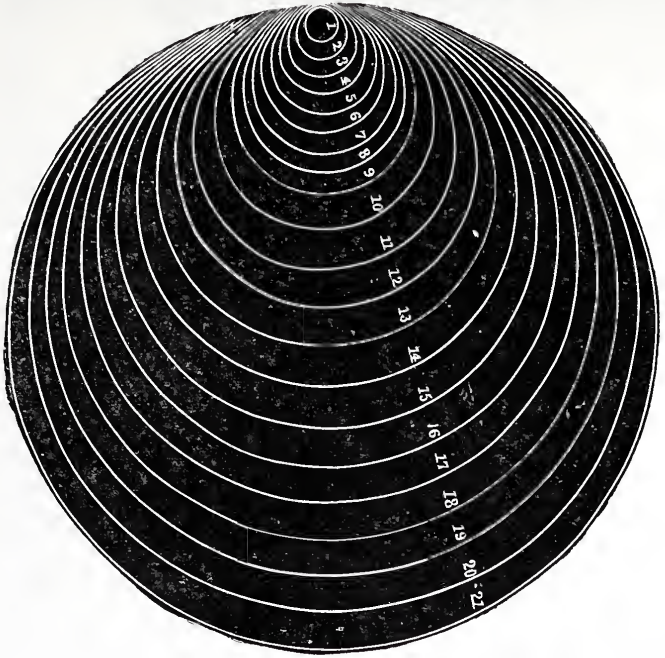
"UNIFORM SYSTEM" NUMBERS FOR STOPS FROM $\frac{f}{1}$ TO $\frac{f}{100}$.

In the following table Mr. S. A. Warburton has calculated the exposure necessary with every stop from $\frac{f}{1}$ to $\frac{f}{100}$ compared with the unit stop of the "uniform system" of the Photographic Society of Great Britain. The figures which are underlined show in the first column what $\frac{f}{a}$ must be in order to increase the exposure in geometrical ratio from $\frac{f}{4}$, the intermediate numbers showing the uniform system number for any other aperture.

f	U. S. No.	f	U. S. No.	f	U. S. No.
1	$\frac{1}{16}$	15	14.06	58	210.25
1¼	.097	16	16	59	217.56
1.414	⅛	17	18.06	60	225.00
1½	.140	18	20.25	61	232.56
1¾	.191	19	22.56	62	240.25
2	¼	20	25.00	63	248.06
2¼	.316	21	27.56	64	256
2½	.390	22	30.25	65	264.06
2.828	⅛	22.62	32	66	272.25
2¾	.472	23	33.06	67	280.56
3	.562	24	36.00	68	289.00
3¼	.660	25	39.06	69	297.56
3½	.765	26	42.25	70	306 25
3¾	.878	27	45.56	71	315.06
4	1.00	28	49.00	72	324.00
4¼	1.12	29	52.56	73	333.06
4½	1.26	30	56.25	74	342.25
4¾	1.41	31	60.06	75	351.56
5	1.56	32	64	76	361.00
5¼	1.72	33	68.06	77	370.56
5½	1.89	34	72.25	78	380.25
5.656	2	35	76.56	79	390.06
5¾	2.06	36	81.00	80	400.00
6	2.25	37	85.56	81	410.06
6¼	2.44	38	90.25	82	420.25
6½	2.64	39	95.06	83	430.56
6¾	2.84	40	100.00	84	440.00
7	3.06	41	105.06	85	451.56
7¼	3.28	42	110.25	86	462.25
7½	3.51	43	115.56	87	473.06
7¾	3.75	44	121.00	88	484.00
8	4	45	126.56	89	495.06
8¼	4.25	45.25	128	90	506.25
8½	4.51	46	132.25	90.50	512
8¾	4.78	47	138.06	91	517.56
9	5.06	48	144.00	92	529.00
9¼	5.34	49	150.06	93	540.56
9½	5.64	50	156.25	94	552.25
9¾	5.94	51	162.56	95	564.06
10	6.25	52	169.00	96	576.00
11	7.56	53	175.56	97	588.06
11.31	8	54	182.25	98	600.25
12	9.00	55	189.06	99	612.56
13	10.56	56	196.00	100	625.00
14	12.25	57	203.06		

THE PHOTOGRAPHIC SOCIETY'S (OF GREAT BRITAIN) STANDARD DIAPHRAGMS.

THE annexed diagram and table are intended to facilitate the calculation of the proper number with which to mark the diaphragms according to the Photographic Society of Great Britain's Uniform System, which will be found described on another page. This number it is proposed to call the "U. S." (or uniform system number). The numbered circles in the diagram represent the sizes of stops. The photographer, knowing the equivalent focus of his lens, looks along the line opposite the number which represents the circle nearest inside to his diaphragm, and when he gets to the column headed by that equivalent focus the number there found is the U. S. number to be marked on the diaphragm. For example: A lens of eight inches equivalent focus has a diaphragm in size about No. 5 on the diaphragm; running the eye along the line opposite No. 5 we find in the column under—"focus eight inches" the No. 11, which is the U. S. number required.



No. of Circle.	4 focus	5 focus	6 focus	7 focus	8 focus	9 focus	10 focus	12 focus	14 focus
1	25	39	56						
2	11	17	25	34	44	56	68		
3	6¼	10	14	19	25	31	40	56	
4	4	6¼	9	12	16	20	25	36	48
5	2¾	4⅓	6¼	8⅛	11	14	17	25	34
6	2	3⅕	4½	6¼	8	10	13	18	25
7	1½	2⅓	3⅛	4⅜	6	8	10	14	19
8	1¼	2	2¾	3⅜	5	6¼	8	11	15
9	1	1½	2¼	3	4	5	6¼	9	12¼
10		1	1½	2⅛	2¾	3⅛	4⅓	6	8½
11			1¼	1½	2	2⅝	3⅕	5	6
12			⅞	1⅕	1½	2	2½	3½	4¾
13				1	1¼	1⅝	1⅞	2⅞	4
14					1	1¼	1½	2½	3
15						1	1⅓	1⅞	2½
16							1	1½	2
17								1⅓	7⅞
18								1⅛	1½
19								1	1⅓
20									1⅕
21									1

NOTE.—This table, taken from the "British Journal Photographic Almanac," has proved to be very convenient in the calculating of stop values.

EQUATIONS RELATING TO FOCI.

The following simple optical formulas and calculations, worked out by Mr. J. A. C. Branfill, for the *British Journal Almanac*, will prove useful in many branches of photography, especially where several lenses of varying foci are in constant use for a variety of purposes:

p = Principal focus.
F = Greater conjugate focus.
f = Lesser conjugate focus.
r = Ratio of any dimension in original to the same dimensions in copy (in case of reduction), or *vice versa* (in case of enlargement).
a = Diameter of aperture to lens.
x = Exposure required, assuming that $x = 1$ when $a = \frac{p}{4}$.

$$p = \frac{r\,(F+f)}{(r+1)^2}$$

$$f = p\left(\frac{1+r}{r}\right) = \frac{F+f}{r+1}$$

$$F = p\,(r+1) = rf$$

$$F+f = p \times \frac{(r+1)^2}{r} = p\left(2+r+\frac{1}{r}\right)$$

$$r = \frac{F-p}{p} = \frac{p}{f-p} = \frac{F}{f}$$

$$x = \frac{f^2}{16\,a^2}$$

N. B.—For ordinary landscape work, where r is greater than 20, x may be taken as $\frac{p^2}{16\,a^2}$

NOTE.—In case the above may not be clear to some photographers, the following rules may be better understood:

To find the principal focus of a lens (p), focus a near object in the camera, and measure the distance between it and the ground glass ($F+f$); next find the proportion which any dimension in the object bears to the same dimension on the ground glass (r). Thus, if the original dimension be four times as large as its reproduction, we say that r equals (=) 4. Multiply $F+f$ by r, and divide the product by the square of a number greater by one than r, that is by $(r+1)^2$. This rule was lately published by Mr. Debenham.

To find the lesser conjugate focus (f) (if p and r are known), multiply p by the sum of $r+1$ and divide the product by r. Or divide $F+f$ by $r+1$.

To find the greater conjugate focus (F) multiply p by $r+1$. Or multiply f by r.

To find $F+f$ (the distance which the ground glass should be from the object to be copied in order to get a given value for r) multiply p by the sum of $r+\frac{1}{r}+2$.

To find r divide $F-p$ (the difference between F and p) by p. Or divide p by $f-p$. Or divide F by f.

To find x divide the square of f by 16 times the square of a (the diameter of aperture to lens).

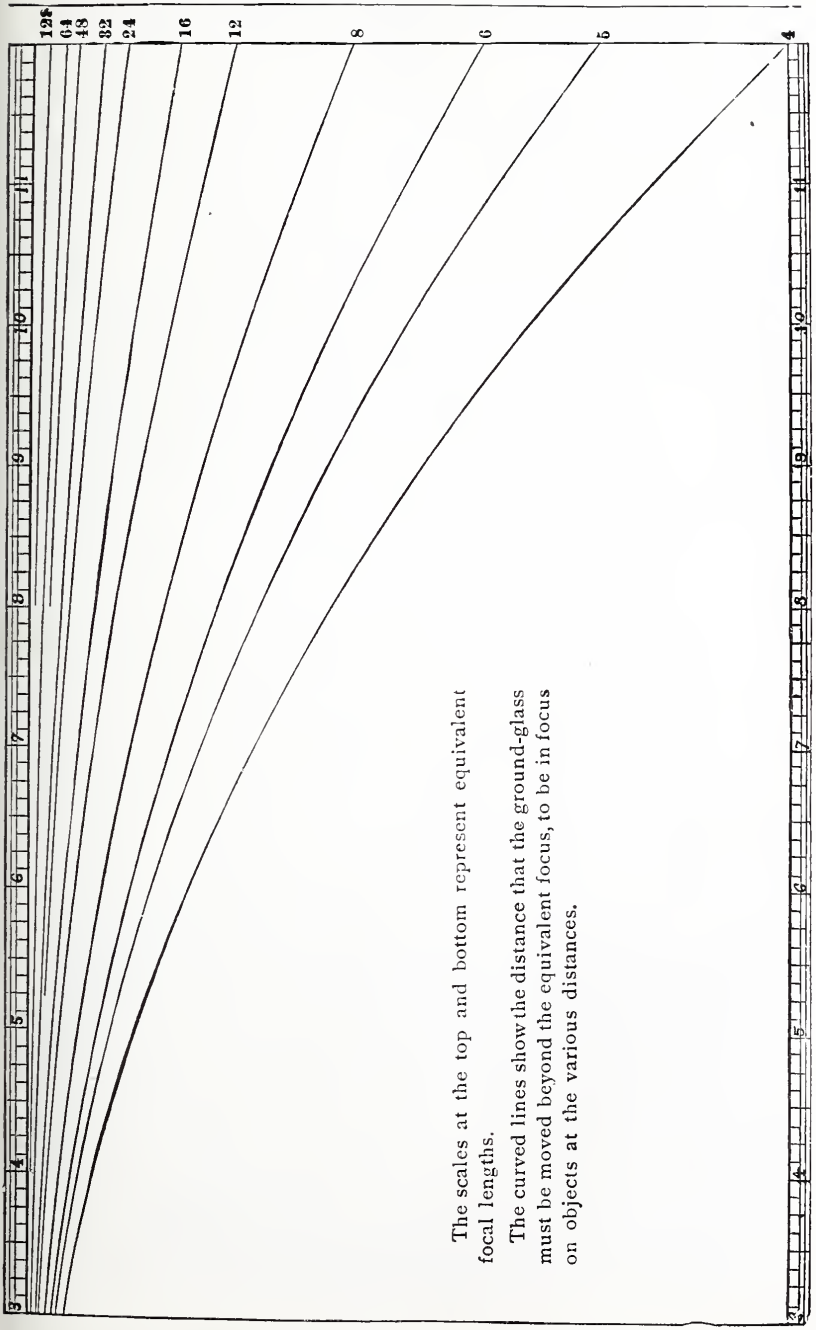
For example Focus an object which is five inches high, so that it is one inch high on the ground glass; thus we know that $r = 5$. Next measure the distance between the object and the ground glass ($F+f$), which is found to be 45 inches.

Then $p = 45 \times$ (multiplied by) $5 \div$ (divided by) $6 \times 6 = 6\frac{1}{4}$ inches.
$f = 6\frac{1}{4} \times 6 \div 5 = 7\frac{1}{2}$ inches. Or $f = 45 \div 6 = 7\frac{1}{2}$ inches.
$F = 6\frac{1}{4} \times 6 = 37\frac{1}{2}$ inches. Or $F = 7\frac{1}{2} \times 5 = 37\frac{1}{2}$ inches.
$F+f = 6\frac{1}{4} \times (5+\frac{1}{5}+2) = 6\frac{1}{4} \times 7\frac{1}{5} = 45$ inches.
$r = (37\frac{1}{2} - 6\frac{1}{4}) \div 6\frac{1}{4} = 5$. Or $r = 6\frac{1}{4} \div (7\frac{1}{2} - 6\frac{1}{4}) = 5$.

And x (the exposure required) will be $7\frac{1}{2} \times 7\frac{1}{2} \div (16 \times \frac{9}{16}) = 6\frac{1}{4}$; that is, the exposure will be $6\frac{1}{4}$ times as much as the exposure required with an aperture whose diameter equals $p \div 4$, assuming the aperture (a) to be $\frac{1}{4}$ inch diameter.

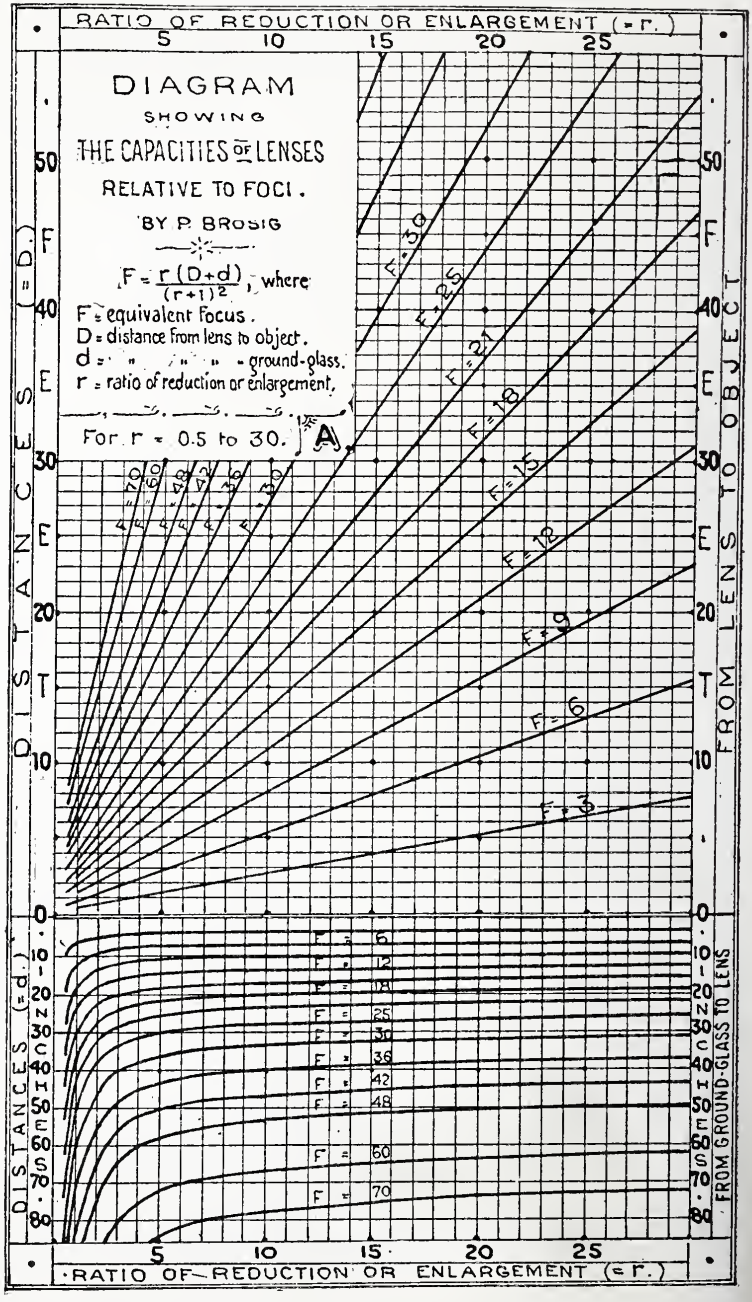
FOCUSING SCALES FOR ANY LENS OF FROM 3 TO 12 INCHES EQUIVALENT FOCUS.

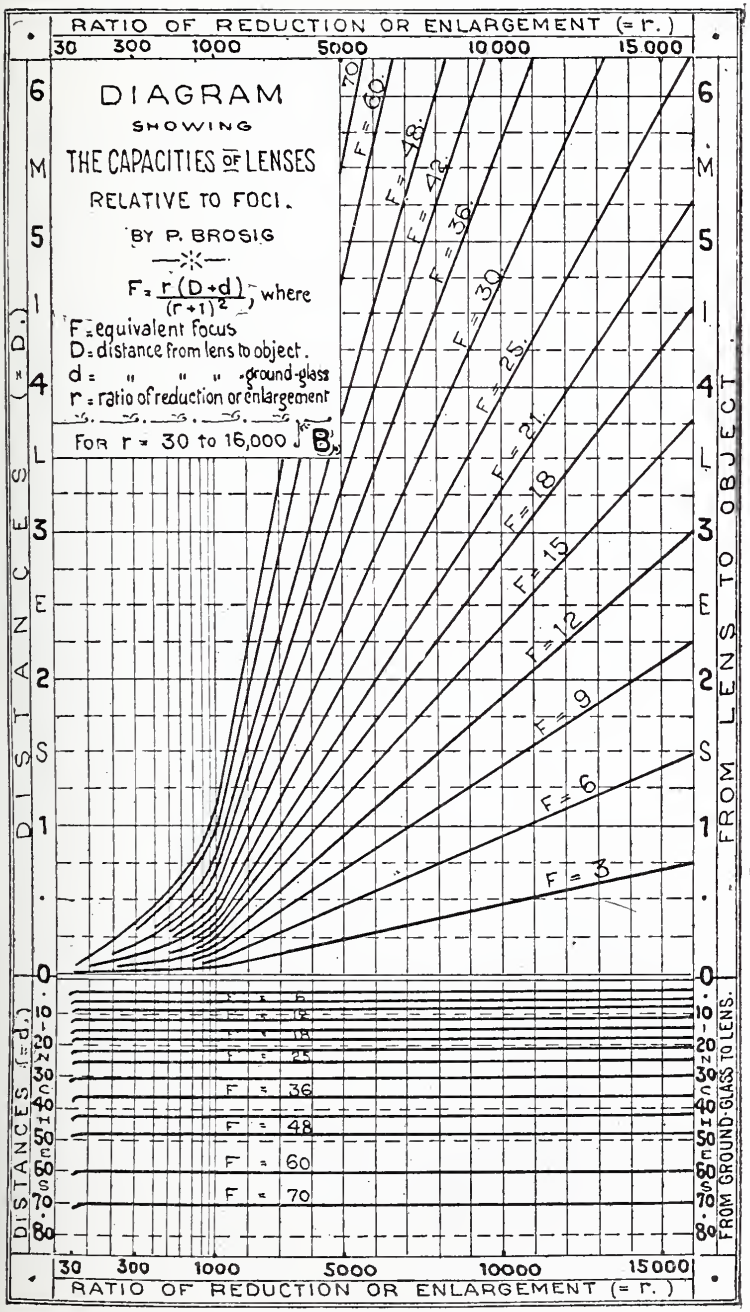
Drawn by W. T. WINTRINGHAM.



The scales at the top and bottom represent equivalent focal lengths.

The curved lines show the distance that the ground-glass must be moved beyond the equivalent focus, to be in focus on objects at the various distances.


RATIO OF REDUCTION OR ENLARGEMENT (= r.)
5 10 15 20 25
DIAGRAM
SHOWING
THE CAPACITIES OF LENSES
RELATIVE TO FOCI.
BY P. BROSIG
$F = \frac{r(D+d)}{(r+1)^2}$, where
F = equivalent Focus.
D = distance from lens to object.
d = " " " " ground-glass.
r = ratio of reduction or enlargement.
For r = 0.5 to 30.
A
DISTANCES (= D.) FROM LENS TO OBJECT
F = 30
F = 25
F = 21
F = 18
F = 15
F = 12
F = 9
F = 6
F = 3
DISTANCES (= d.) FROM GROUND-GLASS TO LENS
F = 6
F = 12
F = 18
F = 25
F = 30
F = 36
F = 42
F = 48
F = 60
F = 70
INCHES
RATIO OF REDUCTION OR ENLARGEMENT (= r.)


RATIO OF REDUCTION OR ENLARGEMENT (= r.)
30 300 1000 5000 10000 15000
DIAGRAM
SHOWING
THE CAPACITIES OF LENSES
RELATIVE TO FOCI.
BY P. BROSIG
F = r(D+d) / (r+1)², where
F = equivalent focus
D = distance from lens to object.
d = " " " ground-glass
r = ratio of reduction or enlargement
FOR r = 30 to 16,000
F = 60
F = 48
F = 42
F = 36
F = 30
F = 25
F = 21
F = 18
F = 15
F = 12
F = 9
F = 6
F = 3
DISTANCES (= D.) IN METRES
DISTANCES (= d.) IN CENTIMETRES
FROM LENS TO OBJECT
FROM GROUND-GLASS TO LENS.
0 1 2 3 4 5 6 M.
0 1 2 3 4 5 6 L.
0 · 1 · 2 · 3 · 4 · 5 · 6 · 7 · 8 ·
0 10 20 30 40 50 60 70 80
30 300 1000 5000 10000 15000
RATIO OF REDUCTION OR ENLARGEMENT (= r.)

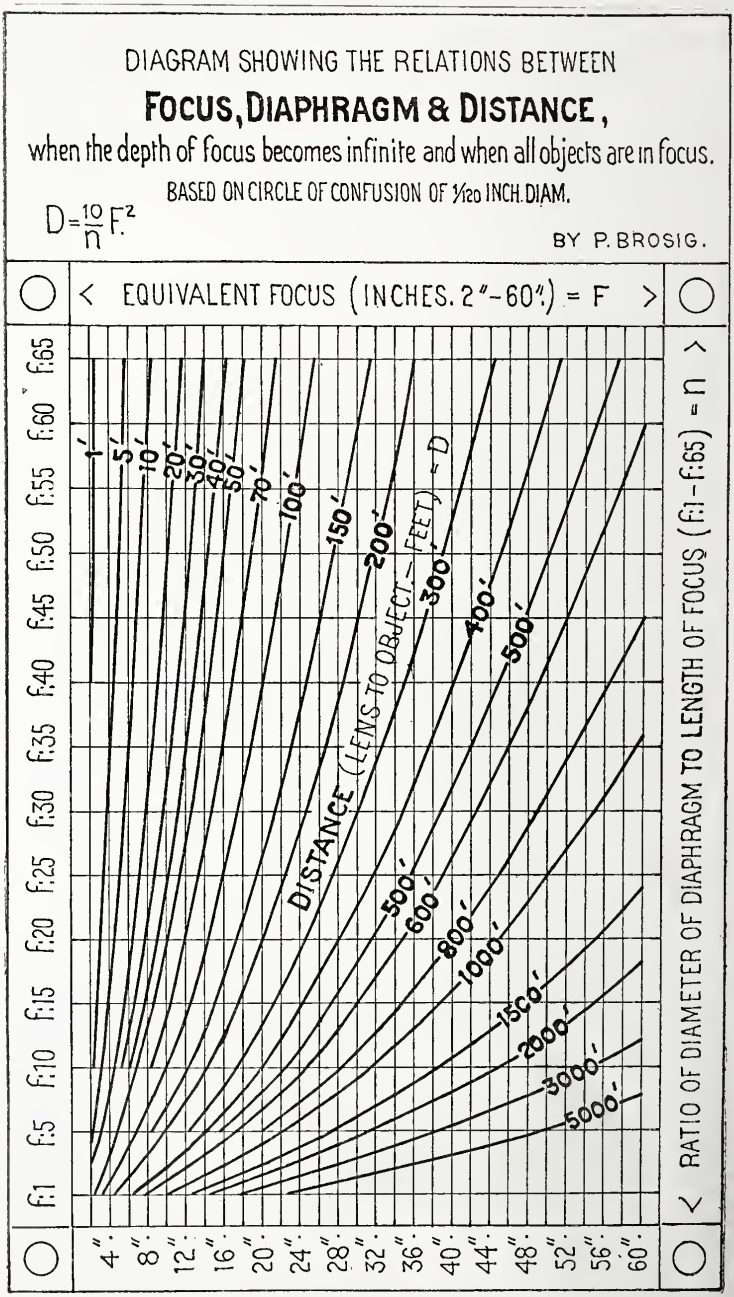

DIAGRAM SHOWING THE RELATIONS BETWEEN
FOCUS, DIAPHRAGM & DISTANCE,
when the depth of focus becomes infinite and when all objects are in focus.
BASED ON CIRCLE OF CONFUSION OF 1/120 INCH DIAM.
$D=\frac{10}{n}F^2$
BY P. BROSIG.
EQUIVALENT FOCUS (INCHES. 2"-60") = F
RATIO OF DIAMETER OF DIAPHRAGM TO LENGTH OF FOCUS (f:1-f:65) = n
f:1 f:5 f:10 f:15 f:20 f:25 f:30 f:35 f:40 f:45 f:50 f:55 f:60 f:65
4" 8" 12" 16" 20" 24" 28" 32" 36" 40" 44" 48" 52" 56" 60"
1' 5' 10' 20' 30' 40' 50' 70' 100' 150' 200' 300' 400' 500'
DISTANCE (LENS TO OBJECT - FEET) = D
500' 600' 800' 1000' 1500' 2000' 3000' 5000'

TABLE OF CONJUGATE FOCI, COMPUTED BY P. BROSIG, FOR AN OBJECT OF 68 INCHES HEIGHT.

EQUIV. FOCUS OF LENS INCHES.	HEIGHTS OF IMAGES (INCHES).																	
	1″	2″	3″	4″	5″	6″	7″	8″	10″	12″	16″	20″	28″	36″	44″	52″	60″	68″
2″	138 2.0	70 2.1	47.3 2.1	36 2.1														
3″	207 3.0	105 3.1	71.0 3.1	54 3.2	43.8 3.2	37.0 3.3	32.1 3.3	NUMBERS ARE OMITED IN THIS SPACE										
4″	276 4.1	140 4.1	94.7 4.2	72 4.2	58.4 4.3	49.3 4.4	42.9 4.4	38.0 4.5	31.2 4.6	ON ACCOUNT OF THE WIDE ANGLE								
5″	345 5.1	175 5.1	118.3 5.2	90 5.3	73.0 5.4	61.7 5.4	53.6 5.5	47.5 5.6	39.0 5.7	33.3 5.9	OF LENS REQUIRED							
6″	414 6.1	210 6.2	142.0 6.3	108 6.4	87.6 6.4	74.0 6.5	64.3 6.6	57.0 6.8	46.8 6.9	40.0 7.1	31.5 7.4							
7″	483 7.1	245 7.2	165.7 7.3	126 7.4	102.2 7.5	86.3 7.6	75.0 7.7	66.5 7.9	54.6 8.0	46.7 8.2	36.7 8.6	30.8 9.1	(MORE THAN 90 DEGREES.)					
8″	552 8.1	280 8.2	189.3 8.4	144 8.5	116.8 8.6	98.7 8.7	85.7 8.8	76.0 9.0	62.4 9.2	53.3 9.4	42.0 9.9	35.2 10.4						
9″	621 9.1	315 9.3	213.0 9.4	162 9.5	131.4 9.7	111.0 9.8	96.4 9.9	85.5 10.2	70.2 10.3	60.0 10.6	47.2 11.1	39.6 11.6	30.9 12.7					
10″	690 10.1	350 10.3	236.7 10.4	180 10.6	146.0 10.7	123.3 10.9	107.1 11.0	95.0 11.3	78.0 11.5	66.7 11.8	52.5 12.4	44.0 12.9	34.3 14.1					
11″	759 11.2	385 11.3	260.3 11.5	198 11.6	160.6 11.8	135.7 12.0	117.9 12.1	104.5 12.4	85.8 12.6	73.3 12.9	57.7 13.6	48.4 14.2	37.7 15.5	31.8 16.8				
12″	828 12.2	420 12.4	284.0 12.5	216 12.7	175.2 12.9	148.0 13.1	128.6 13.2	114.0 13.6	93.6 13.8	80 0 14.1	63.0 14.8	52.8 15.5	41.1 16.9	34.7 18.4	30.6 19.8			
13″	897 13.2	455 13.4	307.7 13.6	234 13.8	189.8 14.0	160.3 14.1	139.3 14.3	123.5 14.7	101.4 14.9	86.7 15.3	68.2 16.1	57.2 16.8	44.6 18.4	37·6 19.9	33.1 21.4	30.0 22.9		
14″	966 14.2	490 14.4	331.3 14.6	252 14.8	204.4 15.0	172.7 15.2	150.0 15.4	133.0 15.8	109.2 16 1	93.3 16.5	73.5 17.3	61.6 18.0	48.0 19.8	40.4 21.4	35.6 23.1	32.3 24.7		
15″	1035 15.2	525 15.4	355.0 15.7	270 15.9	219.0 16.1	185.0 16.2	160.7 16.5	142.5 16.9	117.0 17.2	100.0 17.6	78.7 18.5	66.0 19.4	51.4 21.2	43.3 22.9	38.2 24.7	34.6 26.5	32.0 28.2	30.0 30.0
16″	1104 16.2	560 16.5	378.7 16.7	288 16.9	233.6 17.2	197.3 17.4	171.4 17.6	152.0 18.1	124.8 18.4	106.7 18.8	84.0 19.8	70.4 20.7	54.9 22.6	46.2 24.5	40.7 26.4	36.9 28.2	34.1 30.1	32.0 32.0
18″	1242 18.3	630 18.5	426.0 18.8	324 19 1	262.8 19.3	222.0 19.6	192.9 19.9	171.0 20.3	140.4 20.6	120.0 21.2	94.5 22.2	79.2 23.3	61.7 25.4	52.0 27.5	45.8 29.6	41.5 31.8	38.4 33.9	36.0 36.0
20″	1380 20.3	700 20.6	473.3 20.9	360 21.2	292.0 21.5	246.7 21.8	214.3 22.1	190.0 22.5	156.0 22.9	133.3 23.5	105.0 24.7	88.0 25.9	68.6 28.2	57.8 30.6	50.9 32.9	46.2 35.3	42.7 37.6	40.0 40.0
22″	1518 22.3	770 22.6	520.7 23.0	396 23.3	321.2 23.6	271.3 23.9	235.7 24.3	209.0 24.8	171.6 25.2	146.7 25 9	115.5 27.2	96.8 28.5	75.4 31.1	63.6 33.6	56.0 36.2	50.8 38.9	46.9 41.4	44.0 44.0
24″	1656 24.4	840 24.7	568.0 25.1	432 25.4	350.4 25.8	296.0 26.1	257.1 26·5	228.0 27.1	187.2 27.5	160.0 28.2	126.0 29.6	105.6 31.1	82.3 33.9	69.3 36.7	61.1 39.5	55.4 42.4	51.2 45.2	48.0 48.0
26″	1794 26.4	910 26.8	615.3 27.1	468 27.5	379.6 27.9	320.6 28.3	278.6 28.7	247.0 29.4	202.8 29.8	173.3 30.6	136.5 32.1	114.4 33.6	89.1 36 7	75 1 39.8	66.2 42.8	60.0 45.9	55.5 48.9	52.0 52.0
28″	1932 28.4	980 28.8	662.7 29.2	504 29.6	408.8 30.1	345.3 30.5	300.0 30.9	266.0 31.6	218.4 32.1	186.7 32.9	147.0 34.6	123.2 36.2	96.0 39.5	80.9 42.8	71.3 46.1	64.6 49.4	59.7 52.7	56.0 56.0
30″	2070 30.4	1050 30.9	710.0 31.3	540 31.8	438.0 32.2	370.0 32.6	321.4 33.1	285.0 33.9	234.0 34.4	200.0 35.3	157.5 37.1	132.0 38 8	102.9 42.4	86.7 45.9	76.4 49.4	69.2 52.9	64.0 56.5	60.0 60.0
34″	2346 34.5	1190 35.0	804.7 35 5	612 36 0	511.0 36.5	419.3 37.0	364.3 37.5	323.0 38.4	265.2 39.0	226.7 40.0	178.5 42.0	149.6 44.0	116.6 48.0	98.2 52.0	86.5 56.0	78.5 60.0	72.5 64.0	68.0 68.0
38″	2622 38.6	1330 39.1	899.3 39.7	684 40.2	584.0 40.8	468.6 41.4	407.1 41.9	361.0 42.9	296.4 43.6	253.3 44 7	199.5 46.9	167.2 49.8	130.3 53.6	109.8 58.1	96.7 62.6	87.7 67.1	81.1 71.5	76.0 76.0
42″	2898 42.6	1470 43.2	994.0 43.9	756 44.4	657.0 45.1	518.0 45.7	450.0 46.3	399.0 47.4	327.6 48.2	280.0 49.4	220.5 51.9	184.8 54.3	144.0 59.3	121.3 64.2	106 9 69.2	96.9 74.1	89.6 79.1	84.0 84.0

The table gives, in inches, the distances from lens to object (greater conjugate focus—upper number) nd from lens to ground glass (lesser conjugate focus—lower number) for different heights of images and ifferent lengths of foci of lenses when the height of the object is 68 inches (= AVERAGE HEIGHT OF MAN).

EXAMPLES: To find the height of image of a person which is 114 inches distant from lens, when a lens of : inches focal length is employed.—The heigth of image is in this case 8 inches.

To find the distances between object, lens and ground-glass, if the image of a person is to be 8 inches high nd a 12-inch focus lens is used.—The distance from object to lens will be 114 inches, and from lens to ground-ass 13.6 inches.

TABLE SHOWING DISPLACEMENT ON GROUND GLASS OF OBJECTS IN MOTION.

By HENRY L. TOLMAN.

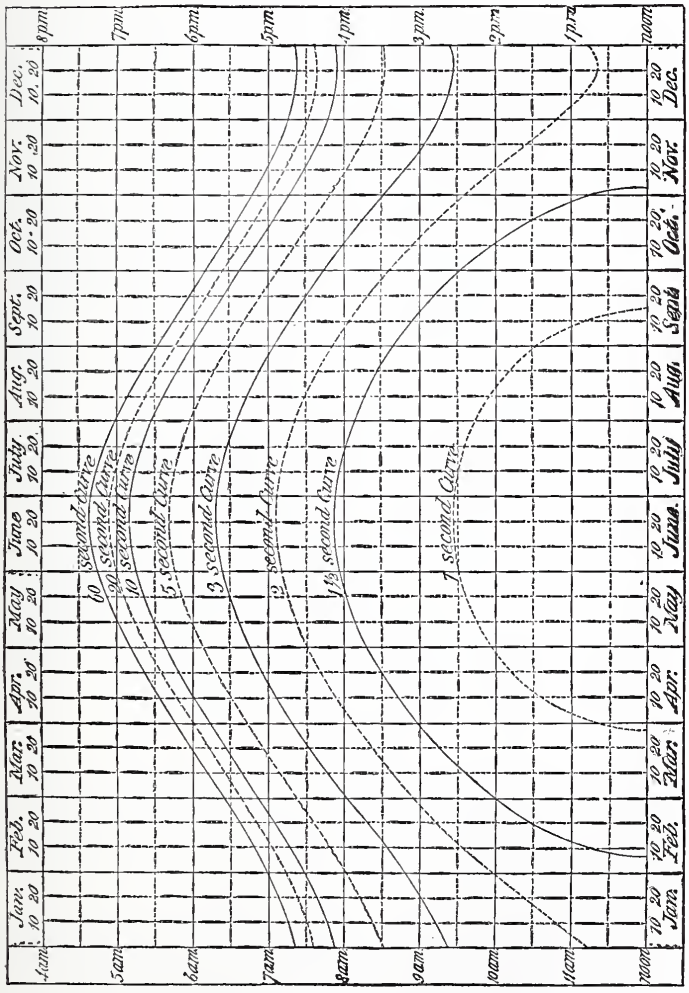
[Republished, with corrections, from the *Photographic Times.*]

Lens 6 in Equiv. Focus, Ground Glass at Principal Focus of Lens.

Miles per Hour.	Feet per Second.	Distance on Ground Glass, in inches, with Object 30 Feet away.	Same with Object 60 Feet away.	Same with Object 120 Feet away.
1	1½	.29	.15	.073
2	3	.59	.29	.147
3	4½	.88	.44	.220
4	6	1.17	.59	.293
5	7½	1.47	.73	.367
6	9	1.76	.88	.440
7	10½	2.05	1·03	.513
8	12	2 35	1.17	.587
9	13	2.64	1.32	.660
10	14½	2.93	1.47	.733
11	16	3.23	1.61	.807
12	17½	3.52	1.76	.880
13	19	3.81	1.91	.953
14	20½	4.11	2.05	1.027
15	22	4.40	2.20	1.100
20	29	5.87	2.93	1.467
25	37	7.33	3.67	1.833
30	44	8.80	4.40	2.200
35	51	10.27	5.13	2.567
40	59	11.73	5.97	2·933
45	66	13.20	6.60	3.300
50	73	14.67	7.33	3.667
55	80	16.13	8.06	4.033
60	88	17.60	8.80	4.400
75	110	22.00	11.00	5.500
100	147	29.33	14.67	7.333
125	183	36.67	18.33	9.167
150	220	44.00	22.00	11.000

DIAGRAM OF COMPARATIVE EXPOSURES.

Computed for the latitude of Washington, D. C. (38 deg., 54 min., N.)
By Lieut. Commander S. W. Very, U. S. N.



The straight lines in this diagram represent divisions of time; the vertical ones showing the month and day, and the horizontal ones the time of day as shown by a sun-dial.

The curved lines are curves of equal altitudes of the sun, computed for the latitude of Washington, for the year 1889.

The combination of the two systems of lines is designed to enable the photographer, whether amateur or professional, who has at some time determined the length of exposure required under certain circumstances of subject, clouds, lens, diaphragm, plate or film, etc., to decide what exposure to give *under the same circumstances*, at any time between sunrise and sunset, on any day of the year.

The diagram is based upon one constructed for the latitude of London, published in the *Photographic News*, in 1887, and reprinted in the ANNUAL of 1888, and the same standard of comparison is used in this adaptation—that is, such circumstances of subject, clouds, lens, diaphragm, plate or film, etc., as will require an exposure of one second, at noon of any day between the 4th of April and the 7th of September, or at any time between a quarter to ten in the forenoon and a quarter past two in the afternoon on the 21st of June.

The diagram, although constructed for the year 1889, and for the latitude of Washington, will serve equally well for any other year, and well enough for ordinary purposes, throughout the United States (exclusive of Alaska), although in the extreme Northern and Southern belts it will not be accurate.

The diagram is strictly accurate for "apparent time" only, but it is sufficiently so for "local mean time" (which may differ sixteen minutes from "apparent time"), and in the great majority of places for "standard time" (which in some places differs half an hour from "mean time," and may differ three-quarters of an hour from "apparent time").

EXAMPLES.

Q. With a certain lens, diaphragm, etc., it is found that on the 20th of July, at 9.30 A.M., a certain subject requires three seconds' exposure; what time should be given on the 10th of December, at 3.30 P.M., the subject, lens, etc., being the same?

A. Fifteen seconds.

Q. At noon of the 15th of May, a certain subject required ten seconds; what length of exposure should be given to the same subject, with the same lens, diaphragm, etc., on the 1st of November, at 8 A.M.?

A. Forty-five seconds.

TABLE OF COMPARATIVE LIGHT VALUES.

By Rev. Dwight W. Smith.

While there is a wider range in timing the exposure of a dry plate than is generally supposed, yet it is well known that there is but one correct interval for the best results with a normal developer. To best approximate that interval at all available hours of the day and year requires some attention and experience. There was a time when plates of a given brand and sensitiveness were quite unreliable, but now that they are so uniform, and improving more and more in this direction, tables of light values that were found to be comparatively useless will now be found of increasing value. The subjoined table, based upon the diagram in this book, by Lieutenant S. W. Very, U. S. N., has been computed for the first half of each month, and at a glance one may obtain information that would otherwise require time and trouble, and that even skill and experience does not always provide for, especially during the time indicated in which there is a rapid loss of light. It will be seen that in January, the light value for noon is given as 1.7, while at 4 P.M. the exposure would necessarily be more than five times that duration. For July, the most rapid as well as longest available light of any month, the light at noon is indicated by .2 instead of 1.7, and at 3 P.M. more than twice the time will be required.

The first column indicates the hour of the day; the second column the comparative light values in whole numbers and tenths.

JANUARY.		FEBRUARY.		MARCH.		APRIL.	
8	10	8	6	8	3	8	2
9	4	9	4	9	2	9	1.5
10	2.5	10	2	10	1.5	10	1.7
11	2	11	1.7	11	1.2	11	1
12	1.7	12	1.5	12	1	12	1
1	1.7	1	2	1	1	1	1
2	2.5	2	2.7	2	1.7	2	1.2
3	4.5	3	3.5	3	2	3	1.5
4	9	4	5	4	4	4	2
		5	60	5	20	5	4
						6	20

MAY.		JUNE.		JULY.		AUGUST.	
8	1.7	8	1.7	8	1.5	8	1.7
9	1.2	9	1.2	9	1.2	9	1.5
10	1	10	1	10	1	10	1
11	.7	11	.6	11	.5	11	.7
12	.5	12	.3	12	.2	12	.5
1	.7	1	.5	1	.5	1	.5
2	1	2	.7	2	1	2	1
3	1.2	3	1.2	3	1.2	3	1.2
4	1.5	4	1.5	4	1.5	4	1.7
5	2.7	5	2.2	5	2.2	5	2.5
6	15	6	5	6	4	6	5
7	80	7	20	7	15	7	60

SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
8	2	8	3	8	4	8	9
9	1.5	9	1.7	9	3	9	3
10	1	10	1.5	10	2	10	2
11	1	11	1.2	11	1 7	11	1.5
12	.5	12	1	12	1.5	12	1.7
1	1	1	1.2	1	1.5	1	2
2	1.2	2	1.5	2	2	2	2.5
3	1.5	3	2	3	2.5	3	3.5
4	2	4	2.7	4	5	4	8
5	3	5	6	5	20	5	80
6	10	6	40	6	70		

PROF. BURTON'S TABLE OF COMPARATIVE EXPOSURES.

Apertures Calculated on the Standard System of the Photographic Society.	Sea and Sky.	Open Landscape.	Landscape with heavy foliage in foreground.	Under Trees, up to		Fairly Lighted Interiors.		Badly Lighted Interiors, up to		Portraits in bright diffused Light out of doors.	Portraits in good Studio Light.		Portraits in Ordinary Room.	
				mins.	secs.	mins.	secs.	hrs.	mins.		mins.	secs.	mins.	secs
No. 1, or $\frac{f}{4}$	$\frac{1}{160}$ sec.	$\frac{1}{80}$ sec.	$\frac{1}{8}$ sec.	0	10	0	10	0	2	$\frac{1}{6}$ sec.	0	1	0	4
No. 2, or $\frac{f}{5.657}$	$\frac{1}{80}$ sec.	$\frac{1}{25}$ sec.	$\frac{1}{4}$ sec.	0	20	0	20	0	4	$\frac{1}{3}$ sec.	0	2	0	8
No. 4, or $\frac{f}{8}$	$\frac{1}{40}$ sec.	$\frac{1}{12}$ sec.	$\frac{1}{2}$ sec.	0	40	0	40	0	8	$\frac{2}{3}$ sec.	0	4	0	16
No. 8, or $\frac{f}{11.314}$	$\frac{1}{20}$ sec.	$\frac{1}{6}$ sec.	1 sec.	1	20	1	20	0	16	$1\frac{1}{3}$ sec.	0	8	0	32
No. 16, or $\frac{f}{16}$	$\frac{1}{10}$ sec.	$\frac{1}{3}$ sec.	2 secs.	2	40	2	40	0	32	$2\frac{2}{3}$ secs.	0	16	1	4
No. 32, or $\frac{f}{22.627}$	$\frac{1}{5}$ sec.	$\frac{2}{3}$ sec.	4 secs.	5	20	5	20	1	4	$5\frac{1}{3}$ secs.	0	32	2	8
No. 64, or $\frac{f}{32}$	$\frac{2}{5}$ sec.	$1\frac{1}{3}$ sec.	8 secs.	10	40	10	40	2	8	$10\frac{2}{3}$ secs.	1	4	4	16
No. 128, or $\frac{f}{45.255}$	$\frac{4}{5}$ sec.	$2\frac{2}{3}$ secs.	16 secs.	21	20	21	20	4	16	21 secs.	2	8	8	32
No. 256, or $\frac{f}{64}$	$1\frac{3}{5}$ sec.	$5\frac{1}{3}$ secs.	32 secs.	42	40	42	40	8	32	42 secs.	4	16	17	4

LANTERNISTS' READY REFERENCE TABLE.

(From Optical Magic Lantern Journal.)

If A=focal length of objective, B=diameter of slide, C=diameter of disc on screen, D=distance between objective and screen, then $D=\frac{C \times A}{B}$ $A=\frac{D \times B}{C}$ $C=\frac{D \times B}{A}$

The following table has been computed by these rules and will show by a glance the relations between the size of disc and distance from screen for object glasses of all foci from 4 inches to 15 inches. The diameter of slide is taken as 3 inches, that being the usual opening of the mat.

Distance between Lantern and Screen.	FOCUS OF LENS.																							
	4in.		5in.		6in.		7in.		8in.		9in.		10in.		11in.		12in.		13in.		14in.		15in.	
	DIAMETER OF DISC.																							
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
10 feet.	7	6	6	0	5	0	4	3	3	9	3	4	3	0	2	9	2	6	2	4	2	2	2	0
11 "	8	3	6	7	5	6	4	9	4	2	3	8	3	4	3	0	2	9	2	6	2	4	2	2
12 "	9	0	7	2	6	0	5	2	4	6	4	0	3	7	3	3	3	0	2	9	2	7	2	5
13 "	9	9	7	10	6	6	5	7	4	11	4	4	3	11	3	7	3	3	3	0	2	9	2	7
14 "	10	6	8	5	7	0	6	0	5	3	4	8	4	2	3	10	3	7	3	3	3	0	2	9
15 "	11	5	9	0	7	6	6	5	5	8	5	0	4	6	4	1	3	9	3	6	3	3	3	0
20 "	15	0	12	0	10	0	8	7	7	6	6	8	6	0	5	6	5	0	4	7	4	3	4	0
25 "	18	9	15	0	12	6	10	9	9	4	8	4	7	6	6	10	6	3	5	0	5	4	5	0
30 "	22	6	18	0	15	0	12	10	11	3	10	0	9	0	8	2	7	6	6	11	6	5	6	0
35 "	26	3	21	0	17	6	15	0	13	1	11	8	10	6	9	6	8	9	8	1	7	6	7	0
40 "	30	0	24	0	20	0	17	2	15	0	13	4	12	0	10	10	10	0	9	2	8	6	8	0
45 "	33	9	27	0	22	6	19	3	16	10	15	0	13	6	12	3	11	3	10	4	9	8	9	0
50 "	37	6	30	0	25	0	21	5	18	9	16	8	15	0	13	8	12	6	11	6	10	9	10	0

EXAMPLES.—An 8in. focus lens at a distance of 35ft. will give a disc of 13ft. 1in. To produce a disc of 12ft. with a lens of 10in. focus, the lantern and screen must be separated by 40ft. To produce a disc of 15ft. at a distance of 45ft. will require a lens of 9in. focus.

TABLE FOR ENLARGEMENT AND REDUCTION.

COMPUTED FOR CENTIMETERS OR INCHES.

Equivalent Focus of the Lens.	DISTANCES OF THE OBJECT AND THE GROUND GLASS SCREEN FROM THE CENTER OF THE OBJECTIVE.																								
	1 *f.*	2 *f.*	3 *f.*	4 *f.*	5 *f.*	6 *f.*	7 *f.*	8 *f.*	9 *f.*	10 *f.*	11 *f.*	12 *f.*	13 *f.*	14 *f.*	15 *f.*	16 *f.*	17 *f.*	18 *f.*	19 *f.*	20 *f.*	21 *f.*	22 *f.*	23 *f.*	24 *f.*	25 *f.*
5..	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130
	10	7.5	6.7	6.2	6	5.8	5.7	5.6	5.6	5.5	5.5	5.4	5.4	5.4	5.3	5.3	5.3	5.3	5.3	5.3	5.2	5.2	5.2	5.2	5.2
6..	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132	138	144	150	156
	12	9	8	7.5	7.2	7	6.9	6.8	6.7	6.6	6.5	6.5	6.5	6.4	6.4	6.4	6.4	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.2
7..	14	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147	154	161	168	175	182
	14	10.5	9.3	8.8	8.4	8.2	8	7.9	7.8	7.7	7.6	7.6	7.5	7.5	7.5	7.4	7.4	7.4	7.4	7.4	7.3	7.3	7.3	7.3	7.3
8..	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144	152	160	168	176	184	192	200	208
	16	12	10.7	10	9.6	9.3	9.1	9	8.8	8.8	8.7	8.7	8.6	8.6	8.5	8.5	8.5	8.4	8.4	8.4	8.4	8.4	8.3	8.3	8.3
9..	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	162	171	180	189	198	207	216	225	234
	18	13.5	12	11.3	10.8	10.5	10.3	10.1	10	9.9	9.8	9.8	9.7	9.6	9.6	9.6	9.5	9.5	9.5	9.5	9.4	9.4	9.4	9.4	9.4
10..	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260
	20	15	13.3	12.5	12	11.7	11.4	11.3	11.1	11	10.9	10.8	10.8	10.7	10.7	10.6	10.6	10.6	10.5	10.5	10.5	10.5	10.4	10.4	10.4
11..	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	187	198	209	220	231	242	253	264	275	286
	22	16.5	14.7	13.8	13.2	12.8	12.6	12.4	12.2	12.1	12	11.9	11.8	11.8	11.7	11.7	11.6	11.6	11.6	11.6	11.5	11.5	11.5	11.5	11.4
12..	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240	252	264	276	288	300	312
	24	18	16	15	14.4	14	13.7	13.5	13.3	13.2	13.1	13	12.9	12.9	12.8	12.7	12.7	12.7	12.6	12.6	12.6	12.5	12.5	12.5	12.5
13..	26	39	52	65	78	91	104	117	130	143	156	169	182	195	208	221	234	247	260	273	286	299	312	325	338
	26	19.5	17.3	16.3	15.6	15.2	14.9	14.6	14.4	14.3	14.2	14.1	14	13.9	13.9	13.8	13.8	13.7	13.7	13.7	13.6	13.6	13.6	13.5	13.5
14..	28	42	56	70	84	98	112	126	140	154	168	182	196	210	224	238	252	266	280	294	308	322	336	350	364
	28	21	18.7	17.5	16.8	16.3	16	15.8	15.6	15.4	15.3	15.2	15.1	15	14.9	14.9	14.8	14.8	14.7	14.7	14.7	14.6	14.6	14.6	14.6
15..	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	360	375	390
	30	22.5	20	18.8	18	17.5	17.1	16.9	16.7	16.5	16.4	16.3	16.2	16.1	16	15.9	15.9	15.8	15.8	15.8	15.7	15.7	15.7	15.6	15.6

16..	32	48	64	80	96	112	128	144	160	176	192	208	224	240	256	272	288	304	320	336	352	368	384	400	416
	32	24	21.3	20	19.2	18.7	18.3	18	17.8	17.6	17.5	17.3	17.2	17.1	17.1	17	16.9	16.9	16.8	16.8	16.8	16.7	16.7	16.7	16.6
17..	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272	289	306	323	340	357	374	391	408	425	442
	34	25.5	22.7	21.3	20.4	19.8	19.4	19.1	18.9	18.7	18.5	18.4	18.3	18.2	18.1	18.1	18	17.9	17.9	17.9	17.8	17.8	17.7	17.7	17.7
18..	36	54	72	90	108	126	144	162	180	198	216	234	252	270	288	306	324	342	360	378	396	414	432	450	468
	36	27	24	22.5	21.6	21	20.6	20.3	20	19.8	19.6	19.5	19.4	19.3	19.2	19.1	19.1	19	18.9	18.9	18.9	18.8	18.8	18.8	18.7
19..	38	57	76	95	114	133	152	171	190	209	228	247	266	285	304	323	342	361	380	399	418	437	456	475	494
	38	28.5	25.3	23.8	22.8	22.2	21.7	21.4	21.1	20.9	20.7	20.6	20.5	20.4	20.3	20.2	20.1	20.1	20	20	19.9	19.9	19.8	19.8	19.8
20..	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500	520
	40	30	26.7	25	24	23.3	22.9	22.5	22.2	22	21.8	21.7	21.5	21.4	21.3	21.3	21.2	21.1	21.1	21	21	20.9	20.9	20.8	20.8
21..	42	63	84	105	126	147	168	189	210	231	252	273	294	315	336	357	378	399	420	441	462	483	504	525	546
	42	31.5	28	26.3	25.2	24.5	24	23.6	23.3	23.1	22.9	22.8	22.6	22.5	22.4	22.3	22.2	22.2	22.1	22.1	22	22	21.9	21.9	21.8
22..	44	66	88	110	132	154	176	198	220	242	264	286	308	330	352	374	396	418	440	462	484	506	528	550	572
	44	33	29.3	27.5	26.4	25.7	25.1	24.8	24.4	24.2	24	23.8	23.7	23.6	23.5	23.4	23.3	23.2	23.2	23.1	23	23	23	22.9	22.9
23..	46	69	92	115	138	161	184	207	230	253	276	299	322	345	368	391	414	437	460	483	506	529	552	575	598
	46	34.5	30.7	28.8	27.6	26.8	26.3	25.9	25.6	25.3	25.1	24.9	24.8	24.6	24.5	24.4	24 4	24.3	24.2	24.2	24.1	24	24	24	23.9
24..	48	72	96	120	144	168	192	216	240	264	288	312	336	360	384	408	432	456	480	504	528	552	576	600	624
	48	36	32	30	28.8	28	27.4	27	26.7	26.4	26.2	26	25.8	25.7	25.6	25.5	25.4	25.3	25.3	25.2	25.1	25.1	25	25	25
25..	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650
	50	37.5	33.3	31.3	30	29.2	28.6	28.1	27.8	27.5	27.3	27.1	26.9	26.8	26.7	26.6	26.5	26.4	26.3	26.3	26.2	26.1	26.1	26	26

The use of the above table will best be explained by illustrations:

To enlarge six times with a lens of 15 centimeters (or inches) focal length. We find in the table under 6 *t.* and opposite 15, the figures $\frac{105}{17.5}$, hence the object must be 17.5, and the screen 105 centimeters (or inches) from the centre of the lens.

To reduce eight times with a lens of 19 centimeters (or inches) focus, the object must be 171 and the screen 21.4 centimeters (or inches) from centre of lens.

The table can be formulated thus: Where p = focal length of lens, a = distance from ground-glass to centre of lens and b = distance from object to centre of lens, then $\frac{1}{a} + \frac{1}{b} = \frac{1}{p}$

USUAL SIZES OF FRENCH, GERMAN AND ITALIAN DRY PLATES.

French and German.	*Inches.*	Italian.	*Inches.*
6½x 9 Centimetres	2.5x 3.6	9x12 Centimetres	3.6x 4.7
9 x12 "	3.6x 4.7	12x16 "	4.7x 6.3
12 x15 "	4.7x 5.9	12x18 "	4.7x 7.2
13 x18 "	5.1x 7.0	13x18 "	5.1x 7.0
12 x20 "	4.7x 7.8	12x20 "	4.7x 7.8
15 x21 "	5.9x 8.2	18x24 "	7.0x 9.4
15 x22 "	5.9x 8.6	21x27 "	8.2x10.6
18 x24 "	7.2x 9.4	24x30 "	9.4x11.8
21 x27 "	8.2x10.6	27x33 "	10.6x12.9
24 x30 "	9.4x11.8	30x36 "	11.8x14.1
27 x33 "	10.6x12.9	40x50 "	15.7x19.6
27 x35 "	10.6x13.7	50x60 "	19.6x23.6
30 x40 "	11.8x15.7		
40 x50 "	15.7x19.6		
50 x60 "	19.6x23.6		

SIZES OF GLASS, MOUNTS, PAPER, ETC.

Petite cards	1⅝x3⅛
One-ninth plate	2 x2½
One-sixth plate	2¾x3¼
One-fourth plate	3¼x4¼
Half plate	4¼x5½ and 4¼x6½
Half plate (English)	4¾x6½
Whole plate (4–4)	6½x8½
Extra 4–4	8 x10

Other sizes are expressed by inches.

Sizes of Mounts.

Stereoscopic	3½x7, 4x7, 4¼x7, 4½x7, 5x8		
Victoria	3¼x5	Minette	1½x2⅜
Imperial	7⅞x9⅞	Card	2½x4⅛
Boudoir	5¼x8½	Cabinet	4¼x6½
Panel	4 x8¼	Promenade	4⅛x7⅛

Sizes of Albumen Paper.

18x22¾, 20½x24½, 22x36, 26x40, 27x42.

Size of blotting paper 19x24

FREEZING MIXTURES.

Parts.	Reducing the Temperature From Degrees of the Celsius	To Thermometer.
3 Nitrate of sodium + 4 Water	+ 13.2 deg.	— 5.3 deg.
9 Phosphate of sodium + 4 dilute Nitric acid	+ 10 "	— 9 "
3 Sulphate of sodium + 2 dilute Nitric acid	+ 10 "	—10 "
1 Nitrate of sodium + 4 Water		—10.6 "
1 Chloride of potassium + 4 Water		—11.8 "
5 Sal ammoniac + 5 Saltpetre + 16 Water	+ 10 deg.	—12 "
1 Nitrate of ammonia + 1 Water	+ 10 "	—15.5 "
8 Sulphate of sodium + 5 conc. Sulphuric acid	+ 10 "	—17 "
1 Sulphocyanate of Potass. + 1 Water	+ 18 "	—21 "
1 Chloride of sodium + 3 Snow		—21 "
1 Sal ammoniac + 1 Saltpetre + 1 Water	+ 8 deg.	—24 "
3 Crystal. chloride of calcium + 1 Snow		—36 "
1 Snow + 1 dilute Sulphuric acid	— 5 deg.	—41

LIST OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY, WITH ENGLISH, LATIN, GERMAN AND FRENCH NAMES.

COMPILED BY C. L. LOCHMAN.

ENGLISH.	LATIN.	GERMAN.	FRENCH.
Acid, Acetic	Acidum aceticum	Essigsäure	Acide acetique.
" " Glacial	Acidum aceticum glaciale.	Eisessig	Vinaigre glacial.
" Boric· Boracic	Acidum boricum	Borsäure	Acide borique.
" Chromic	Acidum chromicum	Chromsäure	Acide chromique.
" Citric	Acidum citricum	Citronensäure	Acide citrique.
" Gallic	Acidum gallicum.	Gallussäure	Acide gallique.
" Hydrochloric *Muriatic.*	Acidum hydrochloricum.	Salzsäure	Acide chlorhydrique.
" Hydrofluoric	Acidum hydrofluoricum,	Fluss-säure	Acide fluorhydrique.
" Nitric	Acidum nitricum	Salpetersäure	Acide nitrique (azotique.
" Oxalic	Acidum oxalicum	Oxalsäure	Acide oxalique.
" Pyrogallic; Pyrogallol	Acidum pyrogallicum.	Pyrogallussäure; Pyrogallol.	Acide pyrogallique.
" Tartaric	Acidum tartaricum	Weinsteinsäure	Acide tartarique.
" Sulphuric	Acidum sulphuricum	Schwefelsäure	Acide sulfurique.
" Tannic; Tannin	Acidum tannicum	Gerbsäure	Acide tannique.
Alcohol, Ethyl	Alcohol	Weingeist	Alcool.
Alcohol, Wood	Alcohol methylicum.	Holzgeist	Alcool methylique.
Alum, Ammonia	Aluminii et ammonii sulphas.	Ammoniak-Alaun	Sulphate d' alumine et d'ammoniaque.
Alum, Chrome	Chromii et potassii sulphas.	Chrom-Alaun	Alun chromi-potassique.
Alum, Potassa	Aluminii et potassii sulphas.	Kali-Alaun	Sulfate d'alumine et de potasse.
Amidol (*Diamidophenol Chlorhydrate.*)	Amidolum.	Amidol	Amidol.
Ammonium Bichromate	Ammonii bichromicum	Doppeltchromsaures Ammon.	Bichromate d'ammoniaque.
" Bromide	Ammonii bromidum	Ammoniumbromid	Bromure d'ammonium.
" Carbonate	Ammonii carbonas	Ammoniumcarbonat	Carbonate d'ammoniaque.
" Chloride	Ammonii chloridum	Ammoniumchlorid	Chlorure d'ammonium
" Citrate	Ammonii citras	Ammoniumcitrat	Citrate d'ammoniaque.
" Iodide	Ammonii iodidum	Ammoniumiodid	Iodure d'ammonium.
" Nitrate	Ammonii nitras	Ammoniumnitrat	Azotate d'ammoniaque
" Salicylate	Ammonil salicylas	Ammoniumsalicylat	Salicylate d'ammoniaque.
" Succinate	Ammonii succinas	Ammoniumsuccinat	Succinate d'ammoniaque.
" Sulphocyanate	Ammoniisulphocyanas	Ammoniumsulfocyanat.	Sulfcyanate d'ammoniaque.
" Sulphydrate *Sulphide Solution.*	Liquor ammonii hydrosulphas.	Schwefelammonium-lösung; Ammonium-sulfhydrat.	Sulfhydrate d'ammoniaque.
Barium Bromide	Barii bromidum	Baryumbromid	Bromure de baryum.
" Chloride	Barii chloridum	Baryumchlorid	Chlorure de baryum.
" Iodide	Barii iodidum	Baryumiodid	Iodure de baryum.
" Nitrate	Barii nitras	Baryumnitrat	Nitrate de baryte
Benzin	Benzinum.	Petroleumbenzin	Benzine.
Benzol	Benzolum.	Benzol	Benzole.
Bromine	Bromum; Brominium.	Brom	Brome.
Cadmium (metal)	Cadmium	Cadmium; Kadmium.	Cadmium.
" Bromide	Cadmii bromidum	Kadmiumbromid; Bromkadmium.	Bromure de cadmium.
" Chloride	Cadmii chloridum	Cadmiumchlorid	Chlorure de cadmium.
" Iodide	Cadmii iodidum	Kadmiumjodid; Jodkadmium.	Iodure de cadmium.
" Nitrate	Cadmii nitras	Cadmiumnitrat	Nitrate de cadmium.
Calcium Bromide	Calcii bromidum	Bromcalcium	Bromure de calcium.
" Carbonate	Calcii carbonas	Calciumcarbonat	Carbonate de chaux.
" Iodide	Calcii iodidum	Jodcalcium	Iodure de calcium.
Chloroform	Chloroformum	Chloroform	Chloroforme.

LIST OF THE PRINCIPAL CHEMICALS, ETC.—*Continued.*

ENGLISH.	LATIN.	GERMAN.	FRENCH.
Collodion	Collodium	Collodion	Collodion.
Cobalt Chloride	Cobalti chloridum	Cobaltchlorid	Chlorure de cobalt.
Copper, metal	Cuprum	Kupfer	Cuivre.
" Bromide	Cupri bromidum	Kupferbromid	Bromure de cuivre.
" Chloride	Cupri chloridum	Kupferchlorid	Chlorure de cuivre
" Nitrate	Cupri nitras	Kupfernitrat	Nitrate de cuivre.
" Sulphate	Cupri sulphas	Kupfersulfat	Sulfate de cuivre.
Dextrin	Dextrinum	Stärkegummi	Dextrine.
Eikonogen	Eikonogenum	Eikonogen	Eikonogen.
Ether (Sulphuric)	Aether (sulphuricus)	Aether; Schwefeläther	Ether sulfurique.
Gelatin	Gelatina	Gelatin	Gelatine.
Glycerin	Glycerinum	Glycerin	Glycerine.
Glycin	Glycinum	Glycin	Glycine.
Gold	Aurum	Gold	Or.
" Terchloride	Auri chloridum	Goldchlorid	Chlorure d'or.
" and Sodium Chloride.	Auri et sodii chloridum	Natriumgoldchlorid	Chlorure d'or et de Sodium.
Gum Arabic	Gummi Arabicum	Arabisches Gummi	Gomme Arabique.
Gum Sandarac	Sandarac	Sandarak	Sandaraque.
Gum Shellac	Ressina lacca	Lack Gummilack	Laque.
Hydrochinon; Hydroquinon.	Hydrochinonum	Hydrochinon	Hydrochinon.
Iodine	Iodum: Iodidium	Jod	Iode.
Iron (Metal)	Ferrum	Eisen	Fer.
" Ammonio-Sulphate. (*Ammonio-Ferric Sulphate.*)	Ferri et ammonii sulphas.	Ferro-ammonium sulphat. *Schwefelsaure Eisenoxydul-ammoniak.*	Sulfate d'ammoniaque et de fer.
" Chloride (Ferrous) (*Ferro Chloride*).	Ferro chloridum	Eisenchlorür (*Ferrochlorid*).	Chlorure de fer. (*Chlorure ferreux*)
" Chloride (Ferric). (*Ferric Chloride*).	Ferri chloridum. (*Ferri-sesquichloridum*).	Eisenchlorid (*Ferrichlorid*).	Perchlorure de fer.
" Iodide	Ferri iodidum	Eiseniodid (Jodeisen; Ferroiodid)	Iodure de fer.
" Oxalate (Ferrous)	Ferro-oxalas	Eisenoxalat	Oxalate de fer.
" Sulphate	Ferri sulphas	Ferrosulfat	Sulfate de fer.
Lead (Metal)	Plumbum	Blei	Plomb.
" Acetate	Plumbi acetas	Bleiacetat	Acetate de plomb.
" Chloride	Plumbi chloridum	Bleichlorid	Chlorure de plomb.
" Nitrate	Plumbi nitras	Bleinitrat	Nitrate de plomb.
Lithium Bromide	Lithii bromidum	Bromlithium	Bromure de lithium.
" Iodide	Lithii iodidum	Jodlithium	Iodure de lithium.
Magnesium Bromide	Magnesii bromidum	Brommagnesium	Bromure de magnesium
" Iodide	Magnesii iodidum	Jodmagnesium	Iodure de magnesium.
" Sulphate	Magnesii sulphas	Magnesiumsulfat	Sulfate de magnesie.
Mercury Bichloride	Hydrargyri bichloridum.	Aetzendes Quecksilber chlorid.	Deutochlorure de mercure.
Metol (*Monomethyl-paramido-meta-cresolate.*)	Metolum	Metol	Metole.
Oil of Lavender	Oleum Lavandulæ	Lavendelöl	Essence de Lavand.
Oil of Turpentine	Oleum Terebinthinæ	Terpintinöl	Essence Terebinthine.
Para-amidophenol Hydrochlorate.	Para-amidolphenol-hydrochloras.	Paramidophenol-hydrochlorat.	Para-amidophenol-hydrochlorate.
Platinum Chloride	Platini chloridum	Platinchlorid	Perchlorure de platine.
Platino Potassium Chloride.	Platini et Potassii chloridum.	Kali-Platinumchlorid	Chlorure de platinum et de potassium.
Potassa, Sulphnrated; Lilver of Sulphur.	Potassa sulphurata	Schwefelleber	Sulfure de potasse.
Potassium Acetate	Potassii acetas	Kaliumacetate	Acetate de potasse.
" Bichromate	Potassii bichromas	Kaliumbichromat	Bichromate de potasse.
" Bromide	Potassii bromidum	Kaliumbromid	Bromure de potassium.
" Carbonate	Potassii carbonas	Kaliumcarbonat	Carbonate de potasse.
" Citrate	Potassii citras	Kaliumcitrat	Citrate de potasse.
" Chloride	Potassii chloridum	Kaliumchlorid	Chlorure de potassium.
" Cyanide	Potassii cyanidum	Cyankalium	Cyanure de potassium.
" Ferricyanide	Potassii ferricyanidum	Ferridcyankalium	Ferricyanure de potassium.
" Ferrocyanide	Potassii ferrocyanidum	Ferrocyanklium	Ferrocyanure de potassium.
" Hydrate; Potassa.	Potassii hydras; Potassa.	Aetzkali	Potasse caustique.

LIST OF THE PRINCIPAL CHEMICALS, ETC.—*Continued.*

ENGLISH.	LATIN.	GERMAN.	FRENCH.
Potassium Iodide	Potassii iodidum	Jodkalium	Iodure de potassium.
" Metabisulphite	Potassii metabisulphis.	Kalium-metabisufis	Metabisulfis de potassium.
" Nitrate	Potassii nitras	Kaliumnitrat	Nitrate de potasse.
" Oxalate, neutral.	Potassii oxalas	Kalium Oxalat, neutrales.	Oxalate de potasse.
" Permanganate	Potassii permanganas.	Kaliumpermanganate.	Permanganate de potasse.
" Sulphite	Potassii sulphis.	Kaliumsulfit.	Sulfite de potassium.
" Sulphocyanide	Potassii sulphocyanidum.	Kalium sulfocyanat; Rhodankalium.	Sulfocyanure de potassium.
Pyroxylin; Gun Cotton.	Pyroxylinum.	Collodionwolle; Schiess-baumwolle.	Pyroxyle; Fulmi-coton
Reducin	Reducinum	Reducin	Reducine.
Rodinal	Rodinalum	Rodinal.	Rodinale.
Silver	Argentum	Silber.	Argent.
" Acetate	Argenti acetas	Silberacetat	Acetate d'argent.
" Citrate	Argenti citras	Silbercitrate	Citrate d'argent.
" Chloride	Argenti chloridum	Silberchlorid	Chlorure d'argent.
" Iodide	Argenti iodidum	Silberiodid	Iodure d'argent.
" Nitrate	Argenti nitras	Silbernitrat	Nitrate d argent.
" Oxide	Argenti oxidum	Silbor Oxyd	Oxyde d'argent.
" Sulphate	Argenti sulphas	Silbersulfat	Sulfate d'argent.
Sodium Acetate	Sodii acetas	Natriumacetate	Acetate de soude.
" Biborate; Borax.	Sodii biboras	Natriumborat; Borax.	Borate de soude.
" Bicarbonate	Sodii bicarbonas	Natriumbicarbonat	Bicarbonate de soude.
" Bromide	Sodii bromidum	Bromnatrium	Bromure de sodium.
" Carbonate	Sodii carbonas	Natriumcarbonat	Carbonate de soude.
" Chloride	Sodii chloridum	Chlornatrium	Chlorure de sodium.
" Citrate	Sodii citras	Natriumcitrat; Citronensaures Natron.	Citrate de soude.
" Hydrate; Soda	Sodii hydras; Soda	Aeznatron	Soude caustique.
" Hyposulphite or Thiosulphate.	Sodii hyposulphis	Unterschwefligsaures Natron.	Hyposulfite de soude.
" Iodide	Sodii iodidum	Jodnatrium.	Iodure de sodium.
" Sulphate	Sodii sulphas	Natriumsulfat	Sulfate de soude.
" Sulphite	Sodii sulphis	Natrium sulfit	Sulfite de soude.
" Tungstate	Sodii tungstas	Wolfraumsaures Natron.	Tungstate de soude.
Starch	Amylum	Stärke; Stârkmehl	Amidon.
Strontium Bromide	Strontii bromidum	Bromstrontium	Bromure de strontium.
" Chloride	Strontii chlordum	Chlorstrontium	Chlorure de strontium.
" Iodide	Strontii iodidum	Jodstrontium	Iodure de strontium.
Tannin, see Tannic Acid.			
Turpentine, Crude or White.	Terebinthina communis.	Geweiner Terpentin.	Terebenthine commune.
Uranium Bromide	Uranii bromidum	Bromuranium	Bromure d'uranium.
Uranium Nitrate	Uranii nitras	Salpetersaures Uranoxyd.	Nitrate d'urane.
Water, Distilled	Aqua destillata	Destillirtes Wasser	Eau distillée.
Water of Ammonia	Aqua ammoniæ	Salmiakgeist; Ammoniak-Flussigkeit.	Eau d'ammoniaque.
Zinc Bromide	Zinci bromidum	Zinkbromid; Bromzink.	Bromure de zinc.
Zinc Chloride	Zinci chloridum	Chlorzink	Chlorure de zinc.
Zinc Iodide	Zinci iodidum	Zinkjodid; Jodzink	Iodure de zinc.

PHOTOGRAPHIC SCHOOLS OF INSTRUCTION.

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BRAUNSCHWEIG DEPARTMENT OF POLYTECHNICAL SCHOOL. Prof. Dr. C. Koppe and Dr. Max Muller. Theory and Practice; Photo-micrography; Photo-grammetry.

KARLSRUHE. Prof. Dr. Schuberg. Theory and Practice in Studio and Field; Lectures.

MUNICH. Dr. M. Th. Edmann. Photography applied to the Mechanical Arts.

SCHLOSS GRÖNENBACH, BAVARIA. W. Cronenberg. Mechanical Printing Methods; Wet and Dry Processes.

VIENNA IMPERIAL POLYTECHNICUM. Prof. Dr. Joseph M. Eder. Elements of Photography and Photo-chemistry; Reproduction Methods.

VIENNA IMPERIAL INSTITUTE FOR PHOTOGRAPHIC PRACTICE, REPRODUCTION METHODS, AND MECHANICAL PRINTING. Prof. Dr. Joseph M. Eder, *Director*. Profs. Hans Lenhardt, Alex. Lainer, I. Hörwarter, C. Jasper, *Instructors*. Two Courses of Instruction. Drawing; Chemistry; Optics; Theories of Photographic Processes; Retouching Positives.



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LIST OF THE PRINCIPAL PHOTOGRAPHIC BOOKS PUBLISHED FROM SEPTEMBER 1, 1895 TO AUGUST 31, 1896.

AMERICAN.

SARONY'S SKETCH-BOOK. New York: A. E. Chasmar.

THE FERROTYPER'S GUIDE. By an active Ferrotyper. New York: The Scovill & Adams Company of N. Y.

THE AMERICAN ANNUAL OF PHOTOGRAPHY AND PHOTOGRAPHIC TIMES ALMANAC FOR 1896. Edited by Walter E. Woodbury. New York: The Scovill & Adams Company of N.Y.

PHOTO-ENGRAVING BY THE HALF-TONE PROCESS. By Robert Whitter. New York: The Scovill & Adams Company of N. Y.

ANTHONY'S INTERNATIONAL ANNUAL. Edited by F. J. Harrison. New York: Messrs. E. & H. T. Anthony.

PHOTOGRAPHIC MOSAICS FOR 1896. Edited by E. L. Wilson. New York: Edward L. Wilson.

INSTANTANEOUS PHOTOGRAPHY. By Capt. Abney, F. R. S. New York: The Scovill & Adams Company of N. Y.

PHOTOGRAPHIC PRINTING METHODS. By W. H. Burbank. Fourth edition. New York: The Scovill & Adams Company of N. Y.

PHOTOGRAPHIC AMUSEMENTS. By Walter E. Woodbury. New York: The Scovill & Adams Company of N. Y.

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PHOTOGRAMS OF '95. Compiled by the editor of the *Photogram*. London: Dawbarn & Ward.

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PHOTOGRAPHY FOR ARTISTS. By Hector MacLean. London: P. Lund & Co.

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PICTORIAL PHOTOGRAPHS. By W. L. Colls. London: Kegan, Paul & Co.

THE GRAMMAR OF PHOTO-ENGRAVING. By H. D. Farquhar (English edition). London: Dawbarn & Ward.

PHOTO-CERAMICS. By W. Ethelbert Henry and H. Snowden Ward (second edition). London: Dawbarn & Ward.

THE A B C OF PHOTOGRAPHY. London: The Stereoscopic Co.

THE NEW PHOTOGRAPHY. By A. B. Chatwood. London: Downey & Co.

PHOTOGRAPHIC SURVEYING. By E. Deville. Ottawa, Canada: The Government Printing Bureau.

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PROF. ROENTGEN'S X RAYS. By August Dittmar. London: Whittaker & Co.

HALF-TONE ON THE AMERICAN BASIS. By W. Cronenberg. Bradford: P. Lund & Co.

MODERN OPTICAL INSTRUMENTS. By Henry Offord. London: Whittaker & Co.

THE ELEMENTS OF A PICTORIAL PHOTOGRAPH. By H. P. Robinson. London: P. Lund & Co.

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Die Amateur Photographie. Von Robert Talbot. Berlin: Romain Talbot.

Die Photomechanischen Pressdruckverfahren. Von F. Stolle. Frankfort a.-M: H. Bechold.

Einleitung in die Negative Verfahren. Von Dr. Josef Maria Eder. Halle a.-S: Wilhelm Knapp.

Die Kunst der Vergrosserns auf Papieren und Platten. Von Dr. F. Stolze. Halle a.-S: Wilhelm Knapp.

Gut Licht. Edited by Hermann Schnauss. Dresden: Unger & Hoffman.

Photographischen Notiz Kalender for 1896. Edited by Dr. Stolze and Dr. Miethe. Halle a.-S: Wilhelm Knapp.

Die Photogravure zur Herstellung von Tiefdreuckplatten von Kupfer. Von Otto Volknar. Halle a.-S: Wilhelm Knapp.

Kunstlerische Photographie. Von. J. Raphaels. Dusseldorf: Ed. Liesegang, Verlag.

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Die Zinkâtzung. Von Jacob Husnik. Vienna: A. Hartleben.

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FRENCH.

Les Lumiéres Artificielles en Photographie. Par M. H. Fourtier. Paris: Gauthier-Villars et fils.

Notes sur la Photographie Artistique. Par M. Puyo. Paris: Gauthier-Villars et fils.

Le Rayons X et la Photographie a Travers les Corps Opaque. Par. Chas. Ed. Guillaume. Paris: Gauthier-Villars et fils.

Traité de Photographie Industrielle. Par M. M. Charles Féry, et le Dr. A. Buraio. Paris: Gautier-Villars et fils.

Annuaire Général et International de la Photographie. Edited by M. Marc le Roux. Paris: E. Plon Monvrit.

La Photographie Durant l' Hiver. Par S. Mathet. Paris: Charles Mendel.

Optique Photographie. Par Adolph Miethe. Paris: Gauthier-Villars et fils.

Formulaire Aide Memoire du Photographe. Par Gaston Henri Niewenglouski. Paris: Société d' Editions Scientifique.

La Photographie de l' Invisible. Par G. M. Niewenglouski. Paris; Société d' Editions Scientifique.

La Photocollographie Simplifieé. Par G. Franchard. Paris: Société d' Editions Scientifique.

Les Petits Problémes du Photographie. Par E. Wallon. Paris: Georges Carré.

UNITED STATES PATENTS.

SUITS for redress on account of infringement of patents are brought in the United States Circuit Court for the District where the defendant resides. Redress may be had through an injunction preventing further infringement and an accounting of the damages caused the patentee, or the profits, gains or advantages made by the infringer.

Until recently appeals from decisions rendered by the United States Circuit Court were necessarily taken to the Supreme Court of the United States, and, owing to the great amount of business done by the latter, a delay of at least four years was suffered by an appellee.

A new special Court, designated the Circuit Court of Appeals, has been provided. Appeals may hereafter be taken to this Court, and are likely to be reached and disposed of quite expeditiously. This is of particular advantage to patentees, in view of the fact that their monopolies run but a limited time.

Patents are issued in the name of the United States and under the seal of the Patent Office to any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been abandoned; and by any person who, by his own industry, genius, efforts, and expense, has invented and produced any new and original design for a manufacture, bust, statue, alto-relievo, or bas-relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics, any new and original impression, ornament, pattern, print, or picture to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture; or any new, useful, and original shape or configuration of any article of manufacture, the same not having been known nor used by others before his invention or production thereof, nor patented nor described in any printed publication, upon payment of the fees required by law and other due proceedings had.

Joint inventors are entitled to a joint patent; neither can claim one separately. Independent inventors of distinct and independent improvements in the same machine can not obtain a joint patent for their separate inventions; nor does the fact that one furnishes the capital and another makes the invention entitle them to make application as joint inventors; but in such case they may become joint patentees.

Every patent contains a grant to the patentee, his heirs or assigns, for the term of seventeen years, of the exclusive right to make, use, and vend the invention or discovery throughout the United States and the Territories, referring to the specification for the particulars thereof.

If it appear that the inventor, at the time of making his application, believed himself to be the first inventor or discoverer, a patent will not be refused on account of the invention or discovery, or any part thereof, having been known or used in any foreign country before his invention or discovery thereof, if it had not been before patented or described in any printed publication.

Letters Patent granted under a foreign government will not, while in force, prevent the inventor from obtaining a patent in the United States, unless the invention shall have been introduced into public use into the United States more than two years prior to the application. But every patent granted for an invention which is the subject of Letters

Patent still in force and previously granted to the same inventor in a foreign country will be so limited as to expire at the same time with such foreign patent, or, if there be more than one, at the same time with the one having the shortest unexpired term, but in no case will it be in force more than seventeen years.

Applications.

Application for a patent must be made in writing to the Commissioner of Patents. The applicant must also file in the Patent Office a written description of the same, and of the manner and process of making, constructing, compounding, and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct, compound and use the same; and in case of a machine, he must explain the principle thereof, and the best mode in which he has contemplated applying that principle, so as to distinguish it from other inventions, and particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery. The specification and claim must be signed by the inventor and attested by two witnesses.

The applicant shall make oath that he verily believes himself to be the original and first inventor or discoverer of the art, machine, manufacture, composition, or improvement for which he solicits a patent; that he does not know and does not believe the same was ever before known or used, and shall state of what country he is a citizen. Such oath may be made before any person within the United States authorized by law to administer oaths, or, when the applicant resides in a foreign country, before any minister, charge d'affaires, consul, or commercial agent holding commission under the Government of the United States, or before any notary public of the foreign country in which the applicant may be.

When the nature of the case admits of drawings, the applicant must furnish one copy signed by the inventor or his attorney in fact, and attested by two witnesses, to be filed in the Patent Office. In all cases which admit of representation by model, the applicant, if required by the Commissioner, shall furnish a model of convenient size to exhibit advantageously the several parts of his invention or discovery.

On the filing of such application and the payment of the fee required by law, if, on such examination, it appears that the claimant is justly entitled to a patent under the law, and that the same is sufficiently useful and important, the Commissioner will issue a patent therefor.

Assignments.

Every patent or any interest therein shall be assignable in law by an instrument in writing; and the patentee, or his assigns or legal representatives may, in like manner, grant and convey an exclusive right under his patent to the whole or any specified part of the United States.

Reissues.

A reissue is granted to the original patentee, his legal representatives, or the assignees of the entire interest when, by reason of a defective or insufficient specification, or by reason of the patentee claiming as his invention or discovery more than he had a right to claim as new, the original patent is inoperative or invalid, provided the error has arisen from inadvertence, accident, or mistake, and without any fraudulent or deceptive intention. The applications must be made and the specification sworn to by the inventors, if they be living.

Caveats.

A caveat under the patent law is a notice given to the Office of the caveator's claim as inventor, in order to prevent the grant of a patent to another for the same alleged invention upon an application filed during the life of the caveat without notice to the caveator.

Any citizen of the United States who has made a new invention or discovery, and desires further time to mature the same, may, on payment of a fee of $10, file in the Patent Office a caveat setting forth the object and the distinguishing characteristics of the invention, and praying protection of his right until he shall have matured his invention. Such caveat shall be filed in the confidential archives of the Office and preserved in secrecy, and shall be operative for the term of one year from the filing thereof.

An alien has the same privilege, if he has resided in the United States one year next preceding the filing of his caveat, and has made oath of his intention to become a citizen.

The caveat must comprise a specification, oath, and, when the nature of the case admits of it, a drawing, and, like the application, must be limited to a single invention or improvement.

Fees.

Fees must be paid in advance, and are as follows: On filing each original application for a patent, $15. On issuing each original patent, $20. In design cases: For three years and six months, $10; for seven years, $15; for fourteen years, $30. On filing each caveat, $10. On every application for the reissue of a patent, $30. On filing each disclaimer, $10. For certified copies of patents and other papers, including certified printed copies, ten cents per hundred words. For recording every assignment, agreement, power of attorney, or other paper, of three hundred words or under, $1; of over three hundred and under one thousand words, $2; of over one thousand words, $3. For copies of drawings, the reasonable cost of making them.

RECENT AMENDMENT TO THE RULES OF PRACTICE.

The following regulations for the conduct of proceedings in the Patent Office are established:

65. An applicant will be considered to persist in his claim for a patent without altering his specification in case he fail to act in prosecution of the same for six months after the Office action thereon, and thereupon the Examiner will make a re-examination of the case.

134. In appealable cases in which no limit of appeal is fixed, no appeal will be entertained by any tribunal in the Office unless taken within six months from the action which puts the case in condition for appeal, unless it be shown to the satisfaction of the Commissioner that such delay was unavoidable.

68. In every case pending before the Office more than five years, in which the record raises the presumption that there have been intentional delays in prosecution, the examiner may require the applicant to show cause why the case was not more rapidly prosecuted, and at the hearing thereon, or upon failure of the applicant to appear, the Examiner will determine, under all the circumstances of the case, whether there have been intentional and unreasonable delays in prosecution, and upon finding the fact to be so, he will reject the case for that reason.

Present Rules 65, 69, and 134 are repealed, and the present Rule 68 is renumbered 69.

COPYRIGHT LAW OF THE UNITED STATES.

1. A *printed* copy of the title of the book, map, chart, dramatic or musical composition, engraving, cut, print, photograph, or chromo, or a *description* of the painting, drawing, statue, statuary, or model or design for a work of the fine arts, for which copyright is desired, must be delivered to the Librarian of Congress or deposited in the mail, within the United States, *prepaid*, addressed

LIBRARIAN OF CONGRESS, Washington, D. C.

This must be done on or before day of publication in this or any foreign country.

The *printed title* required may be a copy of the title page of such publications as have title pages. *In other cases the title must be printed expressly for copyright entry*, with name of claimant of copyright. The style of type is immaterial, and the print of a typewriter will be accepted. But a separate title is required for each entry, and *each* title must be printed on paper as large as commercial note. The title of a *periodical* must include the date and number; and each number of the periodical requires a separate entry of copyright.

2. The legal fee for *recording* each copyright claim is 50 cents, and for a *copy* of this record (or certificate of copyright under seal of the office) an additional fee of 50 cents is required, making $1, if certificate is wanted, which will be mailed as soon as reached in the records. Publications which are the production of persons not citizens or residents of the United States, the fee for recording title is $1, and 50 cents additional for a copy of the record. Certificates covering more than one entry in one certificate are not issued.

3. Not later than the day of publication in this country or abroad, two complete copies of the best edition of each book or other article must be delivered, or deposited in the mail within the United States, addressed

LIBRARIAN OF CONGRESS, Washington, D. C.,

to perfect the copyright.

The freight or postage must be prepaid, or the publications inclosed in parcels covered by printed Penalty Labels, furnished by the Librarian, in which case they will come FREE by mail (*not express*), without limit of weight, according to rulings of the Post Office Department. Books must be printed from type set or plates made in the United States; photographs from negatives made in the United States; chromos and lithographs from drawings on stone or transfers therefrom made in the United States.

Without the deposit of copies above required the copyright is void, and a penalty of $25 is incurred. No copy is required to be deposited elsewhere.

The law requires one copy of each new edition, wherein any substantial changes are made, to be deposited with the Librarian of Congress.

4. No copyright is valid unless notice is given by inserting in every copy published, on the title page or the page following, if it be a book; or if a map, chart, musical composition, print, cut, engraving, photograph, painting, drawing, chromo, statue, statuary, or model or design intended to be perfected as a work of the fine arts, by inscribing upon some portion thereof, or on the substance on which the same is mounted, the following words, viz.: "*Entered according to act of Congress, in the year* ———, *by* ———, *in the office of the Librarian of Congress, at Washington*," or at the option of the person entering the copyright, the words: "*Copyright, 18—, by* ———."

The law imposes a penalty of $100 upon any person who has not obtained copyright who shall insert the notice "*Entered according to act of Congress*," or "*Copyright*," etc., or words of the same import, in or upon any book or other article.

5. The copyright law secures to authors and their assigns the

exclusive right to translate or to dramatize any of their works; no notice or record is required to enforce this right.

6. The original term of copyright runs for twenty-eight years. *Within six months before* the end of that time, the author or designer, or his widow or children, may secure a renewal for the further term of fourteen years, making forty-two years in all. Applications for renewal must be accompanied by a printed title and fee; and by explicit statement of ownership, in the case of the author, or of relationship, in the case of his heirs, and must state definitely the date and place of entry of the original copyright. Within two months of date of renewal the record thereof must be advertised in an American newspaper for four weeks.

7. The time of publication is not limited by any law or regulation, but the courts have held that it should take place within a reasonable time. A copyright may be secured for a projected as well as for a completed work. But the law provides for no *caveat*, or notice of interference—only for actual entry of title.

8. Copyrights are assignable by any instrument of writing. Such assignment, to be valid, is to be recorded in the office of the Librarian of Congress within sixty days from execution. The fee for this record and certificate is one dollar, and for a certified copy of any record of assignment, one dollar.

9. A copy of the record (or duplicate certificate) of any copyright entry will be furnished under seal of the office, at the rate of fifty cents each.

10. In the case of books published in more than one volume, or of periodicals published in numbers, or of engravings, photographs, or other articles published with variations, a copyright must be entered for each volume or part of a book, or number of a periodical, or variety, as to style, title, or inscription, of any other article. To *complete* the copyright on a book published serially in a periodical, two copies of each serial part as well as of the complete work (if published separately), should be deposited.

11. To secure copyright for a painting, statue, or model or design intended to be perfected as a work of the fine arts, a definite title and description must accompany the application for copyright, and a mounted photograph of the same, as large as "cabinet size," mailed to the Librarian of Congress not later than the day of publication of the work or design.

The fine arts, for copyright purposes, include only painting and sculpture, and articles of merely ornamental and decorative art should be sent to the Patent Office, as subjects for Design Patents.

12. Copyrights cannot be granted upon Trade-Marks, nor upon names of companies, libraries, or articles, nor upon an idea or device, nor upon prints or labels intended to be used for any article of manufacture. If protection for such names or labels is desired, application must be made to the Patent Office, where they are registered, if admitted, at a fee of $6 for labels, and $25 for trade-marks.

13. The provisions as to copyright entry in the United States by foreign authors, etc., by act of Congress approved March 3, 1891 (which took effect July 1, 1891), are the same as the foregoing, except as to productions of persons, not citizens or residents, which must cover return postages, and are $1 for entry, or $1.50 for entry and certificate of entry (equivalent to 4*s*. 5*d*. or 6*s*. 7*d*.). All publications must be delivered to the Librarian at Washington free of charge. The free penalty labels cannot be used outside of the United States.

The right of citizens or subjects of a foreign nation to copyright in the United States extends by Presidential proclamations of July 1, 1891, April 15, and October 31, 1892, to Great Britain, France, Belgium, Switzerland, Germany, and Italy.

14. Every applicant for a copyright should state distinctly the full name and residence of the claimant, and whether the right is claimed as author, designer, or proprietor. No affidavit or witness to the application is required.

RECORD OF PHOTOGRAPHIC PATENTS.

GRANTED BY THE UNITED STATES BETWEEN THE FIRST DAY OF SEPTEMBER, 1895, AND THE THIRTY-FIRST DAY OF AUGUST, 1896, INCLUSIVE.

Also containing a record of Design Patents issued and Trade Marks registered within the same period.

COMPILED BY WILLIAM S. HODGES, PATENT LAWYER, WASHINGTON, D.C.

ACTINOMETERS.

554,865 dated February 18, 1896. Exposure Meter.
V. L. GEORGE and C. L. WOODSIDE, Malden, Mass.

557,246 dated March 31st, 1896. Photographic Exposure.
G. F. WYNNE, Minera, England.

BURNISHING.

559,694 dated May 5th, 1896. Photographic Burnisher.
P. G. FLEMING and C. W. GENNET, Elizabeth, N. J.

CAMERAS.

552,246 dated December 31st, 1895. Photographic Camera.
F. HAARSTICK, Dusseldorf, Germany.

552,259 dated December 31st, 1895. Photographic Camera.
S. S. PECKENPAUGH and G. M. OTTO, Centralia, Wis.

558,039 dated April 14th, 1896. Photographic Camera.
W. F. CARLTON and H. W. LOCKE, Rochester, N. Y.

558,089 dated April 14th, 1896. Photographic Camera.
G. D. MILBURN, Rochester, N. Y.

561,966 dated June 16th, 1896. Photographic Camera.
J. COLE, London, England.

564,472 dated July 21st, 1896. Photographic Camera.
H. B. CARLTON, Rochester, N. Y.

564,494 dated July 21st, 1896. Photographic Camera.
C. B. WITHINGTON, Janesville, Wis.

564,838 dated July 28th, 1896. Photographic Camera.
G. P. PARRADEE, Buffalo, N Y.

565,204 dated August 4th, 1896. Photographic Camera.
E. GLEASON, Onalaska, Wis.

CAMERAS—KINETOGRAPHIC.

560,424 dated May 19th, 1896. Series Photographic Camera
A. N. PETIT, Roseville, N, J.

560,800 dated May 26th, 1896. Kinetographic Camera.
C. F. JENKINS, Richmond, Ind.

CAMERAS—MAGAZINE.

552,570 dated January 7th, 1896. Magazine Camera.
A. E. YOUNGER, Omaha, Neb.

552,654 dated January 7th, 1896. Magazine Camera.
F. WHITNEY, Winnetka, Ill.

555,805 dated March 3d, 1896. Magazine Camera.
H. Hill and A. L. Adams, London, England.
558,356 dated April 14th, 1896. Magazine Camera.
E. G. Cone and D. R. Close, Chicago, Ill.
563,697 dated July 7th, 1896. Magazine Camera.
C. Umbach, Jersey City, N. J.
565,712 dated August 11th, 1896. Magazine Camera.
J. P. Anderson, Nellerod, Denmark.

CAMERAS—PANORAMIC.

549,504 dated November 12th, 1895. Panoramic Camera.
F. F. Dumke, Milwaukee, Wis.
559,246 dated April 28th, 1896. Panoramic Camera.
H. G. Wood, Newport, R. I.

CAMERA STANDS.

547,855 dated October 15th, 1895. Dark Room Camera.
W. E. Lee, Kansas City, Mo.
560,525 dated May 19th, 1896. Camera Stand.
L. Noble, Haverhill, Mass
566,451 dated August 25th, 1896. Camera Tripod Head.
J. H. Fay, London, England.

DARK ROOM.

553,743 dated January 28th, 1896. Dark Room.
F. A. Wattenberg, New York, N. Y.
557,633 dated April 7th, 1896. Photographic Developing Cabinet.
R. Aramburu, Barcelona, Spain.
558,348 dated April 14th, 1896. Photographic Dark Room.
J. P. Brockway, Denver, Colo.
561,568 dated June 9th, 1896. Portable Dark Room.
R. Daeschner, Cologne, Germany.

EMBOSSING.

556,591 dated March 17th, 1896. Method of Producing Embossed Photographs.
F. A. Taber, San Francisco, Cal.

FINDERS.

565,626 dated August 11th, 1896. Photographic Finder.
A. C. Mercer, Syracuse, N. Y.

FOCUSING DEVICES.

559,885 dated May 12th, 1896. Focusing Attachment for Cameras.
M. C. Booth, Haverford, Pa.

KINETOSCOPES.

546,093 dated September 10th, 1895. Camera Lantern.
O. A. Eames, Boston, Mass.
547,775 dated October 15th, 1895. Kinetoscope for Advertising and Exhibition Purposes.
W. C. Farnum, Arlington, Vt.
549,309 dated November 15th, 1895. Mutoscope.
H. Casler, Syracuse, N. Y.
560,367 dated May 19th, 1896. Apparatus for Exhibiting Successive Photographs.
A. N. Petit, Roseville, N. J.

560,425 dated May 19th, 1896. Apparatus for Exhibiting Successive Photographs.
A. N. PETIT, Roseville, N. J.
566,643 dated August 25th, 1896. Kinotiphone or Katoptrikum.
N. XENOS, New York, N. Y.

LAMPS.

549,975 dated November 19th, 1895. Photographic Lighting Machine.
J. F. OREBAUGH and F. M. HUDDLESTON, Shelbyville, Ind.
555,133 dated February 25th, 1896. Flash Light Machine.
C. D. VERNON, Minto, N. Dak.

LENSES.

547,207 dated October 1st, 1895. Lens for Optical Purposes.
C. P. GOERZ and E. VON HOEGH, Wilmersdorf, Germany.
554,737 dated February 18th, 1896. Lens.
H. L. H. SCHROEDER, New York, N. Y.
557,801 dated April 7th, 1896. Photographic Camera.
ALEJANDRO DUAL YS. JUAN, Havana, Cuba.
560,460 dated May 19th, 1896. Photographic Lens.
H. L. ALDIS, London, England;
562,270 dated June 16th, 1896. Iris Mechanism Casing.
M. BERGER, Jena, Germany.
562,614 dated June 23rd, 1896. Photographic Objective.
D. KAEMPFER, Brunswick, Germany.

MAGIC LANTERNS.

545,452 dated September 3rd, 1895. Stereopticon Panorama Machine.
C. A. CHASE, Chicago, Ills.
546,836 dated September 24th, 1895. Lamp for Advertising Purposes.
A. M. WRIGHT, Birmingham, England.
559,400 dated May 5th, 1896. Scenic Theatre Apparatus for Producing Eclipse Effects.
A. J. OEHRING and A. L. TUCKER, Chicago, Ills.
563,302 dated July 7th, 1896. Scenic Theatre Apparatus for Producing Moon effects.
A. J. OEHRING and A. L. TUCKER, Chicago, Ills.
563,303 dated July 7th, 1896. Scenic Theatre Apparatus for Producing Cloud Effects.
A. J. OEHRING and A. L. TUCKER, Chicago, Ills
563,334 dated July 7th, 1896. Apparatus for Producing Scenic Effects.
A. L. TUCKER, Chicago, Ills.
564,177 dated July 14th, 1896. Magic Lantern.
H. L. HASTINGS and W. RUSSELL, Chelsea, Mass.
564,971 dated August 4th, 1896. Exhibition Apparatus.
W. M. CLINE, Lansing, Mich.
565,346 dated August 4th, 1896. Optical Lantern.
O. GOODYEAR, JR., New York, N. Y.

MECHANICAL PRINTING.

547,780 dated October 15th, 1895. Method of Printing in Colors and Screen Therefor.
J. GAST, Brooklyn, N. Y.
551,266 dated December 10th, 1895. Screen for Photo-Mechanical Printing Processes.
E. G. D. DEVILLE, Ottawa, Canada.
561,132 dated June 2nd, 1896. Photographic Color Screen.
T. C. ROCHE, Brooklyn, N. Y.

MOUNTING.

549,430 dated November 5th, 1895. Photographic Print Mounter.
T. Bevan, Essex, Ills.
563,044 dated June 30th, 1896. Print Mounting Roller.
W. H. Lewis, Huntingdon, N. Y.

PLATE HOLDERS.

547,487 dated October 8th, 1895. Photographic Plate Holder.
O'Rell W. Hodges, Chicago, Ills.
552,766 dated January 7th, 1896. Photographic Plate Holder.
M. Levy and H. L. Bell, Philadelphia, Pa.
558,138 dated April 14th, 1896. Photographic Film Holder.
T. W. Wright and L. D. Preston, Rochester, N. Y.
562,168 dated June 16th, 1896. Photographic Plate Holder.
F. A. Brownell, New York, N. Y.
563,915 dated July 14th, 1896. Photographic Film Holder.
G. Eastman, Rochester, N. Y.

PRINTING AND VIGNETTING.

548,782 dated October 29th, 1895. Photographic Printing Frame.
W. H. Lewis, Huntingdon, N. Y.
550,079 dated November 19th, 1895. Means for Producing Photographs Resembling Engraving.
H. E. Mendelsshon, New York, N. Y.
557,119 dated March 31st, 1896. Apparatus for Photographic Printing.
W. Friese-Greene, London, England.
561,685 dated June 9th, 1896. Photographing Printing Frame.
J. W. McDonough, Chicago, Ills.
562,977 dated June 30th, 1896. Photographic Vignetter.
J. E. Rösch, St. Louis, Mo.
563,853 dated July 14th, 1896. Photographic Printing Apparatus.
W. Friese-Greene, London, England.
563,888 dated July 14th, 1896. Photographic Prining Frame.
H. Sack, Dusseldorf, Germany.

PROCESSES.

559,051 dated April 28th, 1896. Method of Producing Photographs in Colors.
M. Anderson, Northport, Wash.
561,686 dated June 9th, 1896. Multicolored Screen.
J. W. McDonough, Chicago, Ills.
561,687 dated June 9th, 1896. Photographic Negative.
J. W. McDonough, Chicago, Ills.

RETOUCHING.

548,956 dated October 29th, 1895. Photographic Retoucher.
J. N. Choate, Carlisle, Pa.
549,058 dated October 29th, 1895. Photographic Retoucher.
J. N. Choate, Carlisle, Pa.
555,243 dated February 25th, 1896. Photographic Retoucher.
D. M. Harshman, Chicago, Ill.

ROLL-HOLDERS.

549,231 dated November 5th, 1895. Photographic Roll-Holder.
N. Crane, Newton, Mass.
549,232 dated November 5th, 1895. Photographic Roll-Holder.
N. Crane, Newton, Mass.

552,633 dated January 7th, 1896. Roll-Holding Camera.
W. V. Esmond, Chicago, Ills.
554,769 dated February 18th, 1896. Photographic Roll-Holder Spool.
F. A. Brownell, Rochester, N. Y.
556,407 dated March 17th, 1896. Film Loader for Roll-Holders.
W. V. Esmond, Chicago, Ills.
565,323 dated August 4th, 1896. Photographic Roll-Holder.
T. H. Blair and F. H. Kelly, Boston, Mass.
566,100 dated August 18th, 1896, Roll-Holding Camera.
P. K. Stern, St. Louis, Mo.

SHUTTERS.

550,475 dated November 26th, 1895. Photographic Shutter-Releasing Device.
A. M. Boos, Boston, Mass.
562,642 dated June 23d, 1896. Photographic Color Screen.
J. M. McDonough, Chicago, Ills.
564,216 dated July 21st, 1896. Photographic Shutter.
H. Nerrlich, Berlin, Germany.

SHUTTERS, PIVOTED.

546,198 dated September 10th, 1895. Photographic Shutter.
S. Slayton, San Francisco, Cal.
547,541 dated October 8th, 1895. Photographic Camera Shutter.
W. V. Esmond, Chicago, Ills.
549,681 dated November 12th, 1895. Photographic Shutter.
C. C. Packard, Kalamazoo, Mich.
555,986 dated March 10th 1896. Photographic Shutter.
C. Whitney, Winnetka, Ills.
561,672 dated June 9th, 1896. Photographic Shutter.
J. Kruse, Waterbury, Conn.
562,599 dated June 23rd, 1896. Photographic Shutter.
O. Friese, Berlin, Germany.

SURFACES.

550,288 dated November 20th, 1895. Transparent Photographic Film.
R. S. Permiman, Dover, N. J.
557,047 dated March 24th, 1896. Sensitized Photographic Paper.
J. Boettner and T. Dicke, Hoboken, N. J.
559,658 dated May 5th, 1896. Sensitized Photographic Fabrics.
R. A. Anthony, New York, N. Y.
560,003 dated May 12th, 1896. Photograph Salting Solution.
R. Martin, St. Paul, Minn.
560,755 dated May 26th, 1896. Self-Toning Photographic Paper.
E. P. Schoenfeld and E. Kehle, Newark, N. J.
560,756 dated May 26th, 1896. Self-Toning Photographic Paper
E. P. Schoenfeld and E. Kehle, Newark, N. J.
566,111 dated August 18th, 1896. Non-Halation Plate.
E. Wuestner. Jersey City, N. J

STEREOSCOPES.

546,889 dated September 24th, 1895. Photochromoscope and Photochromoscope Camera.
F. E. Ives, Philadelphia, Pa.
548,148 dated October 15th, 1895. Stereoscope.
H. C. White, Bennington, Vt.
548,149 dated October 15th, 1895. Stereoscope.
H. C. White, Bennington, Vt.

552,410 dated December 31st, 1895. Picture Exhibitor.
G. W. Brown, Colorado Springs, Colo.
552,663 dated January 7th, 1896. Stereopticon Advertising Device.
E. Hudson, Hartford, Conn.
553,369 dated January 21st, 1896. Machine for Exhibiting and Taking Pictures.
L. P. Thompson, Waynesborough, Pa.
554,638 dated February 11th, 1896. Panoramic Exhibiting Cabinet.
A. A. Aguero, New York, N. Y.
556,531 dated March 17th, 1896. Stereopticon.
M. G. Crane, Newton, Mass.
557,024 dated March 24th, 1896. Mechanism for Operating Rollers in Winding or Unwinding Bands, Aprons, etc.
J. Richard, Paris, France.
559,878 dated May 12th, 1896. Stereoscope.
H. S. Walbridge, Bennington, Vt.
561,930 dated June 9th, 1896. Stereoscope.
H. S. Walbridge, N. Bennington, Vt.
564,466 dated July 21st, 1896. Stereoscope.
C. Briggs and F. W. Masters, Manchester, England.

STUDIO ACCESSORIES.

557,990 dated April 7th, 1896. Photographic Background Carrier.
R. A. Green and A. R. Lawton, Chicago, Ill.

TRAYS AND TANKS.

546,347 dated September 17th, 1895. Photographic Developing Tray.
W. I. Rood, Spencer, Iowa.
548,787 dated October 29th, 1895. Photographing Developing Tank.
E. Poulenc, Paris, France.
550,599 dated Dec. 3d, 1895. Photographic Developing Apparatus.
E. N. Dickerson, New York, N. Y.
562,239 dated June 16th, 1896. Photographic Washing Tank.
G. R. Perkins, Schuyler, Neb.
562,544 dated June 23d, 1896. Photographic Plate Holder and Developing Apparatus.
J. Landsing, Brooklyn, N. Y.

DESIGN PATENTS.

24,693 dated September 24th, 1895. Card Mount. Seven Years.
F. E. Hastings, Devon, Pa.
24,926 dated November 26th, 1895. Photo Holder. Seven Years.
H. Denby, Cleveland, Ohio.
25,723 dated June 30th, 1896. Easel. Fourteen years.
E. L. Freese, Highwood, N. Y.
25,758 dated July 7th, 1896. Easel Stand. Three and one half Years.
W. Bergner, Baltimore, Md.

TRADE MARKS.

27,580 dated December 31st, 1895. The word "Criterion," applied to Magic Lanterns, Stereopticons, and Similar Goods.
J. B. Colt & Co., New York City.
27,685 dated January 28th, 1896. The combination of the numeral "26" and a cross. Applied to Photographic Dry Plates.
The M. A. Seed Dry Plate Co., St. Louis, Mo.
27,871 dated February 25th, 1896. The word "Bull's-Eye," applied to Photographic Cameras.
Eastman Kodak Co., Rochester, N. Y.

RATES OF DOMESTIC POSTAGE

TO ANY PART OF THE UNITED STATES, CANADA, OR MEXICO.

SEE NOTE H.

	cts.	oz.	See Spec'l Note.
Address Tags	1	1	*a*
Bill Heads	1	1	*a*
Blotters (printed)	1	1	*a*
Blue Prints	1	2	*d*
Books, printed	1	2	*d*
Cards, playing	1	1	*a*
" printed	1	2	*a*
" business			
" Christmas, etc.‡			
" Easter‡			
" New Year‡			
Chromos‡	1	2	*a*
Catalogues	1	2	*d*
Circulars	1	2	*d*
Coins	1	1	*a b*
Copy (MSS.)	2	1	*e*
" (with proof sheets)	1	2	*e*
Crayon	1	1	
Desk Blotters	1	1	*a*
Drawings } Pen or Pencil Designs }	1	1	* *e*
Easter Cards‡	1	2	*a*
Engravings	1	2	*a*
Handbills	1	2	*a*
Letters	2	1	*e*
Labels (printed)	1	2	*a*
Lithographs	1	2	*a*
Manifold Letters	2	1	*e*
Manuscript	2	1	*e*
Magazines	1	4	*d*
Merchandise	1	1	*a b*
Maps (printed)	1	2	*e*
Newspapers	1	4	*d*
New Year Cards‡	1	2	
Packages, sealed	2	1	*b*
Packages, unsealed	1	1	† *b*
Pamphlets	1	2	*d*
Patterns (cut)	1	1	*a*
Periodicals	1	4	*d*
PHOTOGRAPHS	1	2	*d*
Pictures (scrap)	1	2	
Playing Cards	1	1	*a*
Postal Cards	1	ea.	*f*
Printed Matter (*not merchandise or samples*)	1	2	*d*
Printed Envelopes	1	1	*a*
Prospectuses	1	2	*d*
Proof Sheets	1	2	*d g*
Plans (in writing)	2	1	*e*
Registration	8	ea.	*i*
Samples	1	1	*b*
Sample copies of regular publications mailed by publisher (second-class)	1	lb.	
Sample copies of regular publications not mailed by publisher	1	4	*a*
Scrap Pictures	1	2	*a*
Seeds, Plants, etc.	1	2	
Specie	1	1	*a b*
Stereoscopic Views	1	2	*d*
Tickets	1	2	*a*
Type Writer Work	2	1	*e*
Valentines (if printed without embellishment with silk, satin, etc.)	1	2	*a*
Visiting Cards (printed)	1	2	*a*

* If pen or pencil drawings contain no written letters, figures, or words, they are fourth class matter, otherwise first class.

† May be either third or fourth class.

‡ Third-class matter if printed on paper; if on silk, cotton, satin, canvas, or other material than paper or paper board, fourth class matter.

GENERAL NOTES.

Cards, circulars, catalogues, etc., relating to the business of one or more firms, and different articles of all kinds and classes, may be placed in the same package, provided that the highest rate of postage that any part of the contents is subject to shall be prepaid on the whole package.

The following articles are unmailable, and will not be dispatched in any case:—Spirituous, malt, or vinous liquids, poisons, explosive matter, inflammable articles, live or dead animals, insects (except queen bees when safely secured), substances exhaling a bad odor, fresh fruits and vegetables, obscene or indecent books, prints, writings, or papers; all postal cards or letters on the envelopes of which lewd, obscene, or lascivious deliniations, offensive duns, epithets, terms, or language are written or printed, all matter concerning lotteries or schemes devised and intended to defraud the public, or for the purpose of obtaining money under false pretences, and all mail matter not addressed to a post-office or to no particular person, firm, company, or publication.

Special Delivery.—Any mail matter, when bearing, in addition to the regular postage, a "special delivery" stamp (face value, ten cents), will be immediately delivered by special messenger on its arrival at destination, between the hours of 7 A.M. and 7 P.M., and within one mile from the post-office, if it be not a letter-carrier office. At letter-carrier offices special delivery is obligatory within the carrier limits, and between the hours of 7 A.M. and 11 P.M.

Note A.

Fourth Class Matter—Samples and Merchandise.—Weight limited to 4 pounds. Postage must be fully prepaid. The rate is *one cent an ounce or fraction thereof.* Merchandise may have printing on it or on the wrapper. Written marks, in addition to the address, are allowed on Fourth Class matter, as follows:—The name and address of sender preceded by the word "From"; and any names, numbers, marks, or letters for the purpose of description. A request to the delivering Postmaster may also be written asking him to notify sender if the package is not delivered; also an ordinary request to return to the sender in case of non-delivery.

Note B.

Articles of the Fourth Class liable to injure or deface the mails, such as glass, needles, nails, pens, etc., must first be placed in a bag, box or open envelope, which must then be inclosed in another outside tube or box made of metal or hardwood, without sharp corners or edges and having a sliding clasp or screw lid, thus securing the articles in a double package; if the articles are fragile, they must be packed with sawdust, cotton or other packing material in the inside pocket. Powdered articles, such as flour, sugar, etc., may be inclosed in a transparent bag or envelope, and must be securely packed so as to prevent breaking. Admissible liquids and oils (not exceeding 4 ounces liquid measure), pastes, salves or articles easily liquefiable, must conform to the following conditions: When in glass bottles or vials, such bottles or vials must be strong enough to stand the shock of handling in the mails, and must be inclosed in a wooden or papier-mache block or tube *not less than three-sixteenths of an inch thick* in the thinnest part, strong enough to support the weight of mails piled in bags and resist rough handling; and there must be pro-

vided, between the bottle and its wooden case, a cushion of cork crumbs, cotton, felt, asbestos, or some other absorbent, sufficient to protect the glass from shock in handling; the block or tube impervious to liquids, including oils, etc., to be closed by a tightly fitting screw-lid of wood or metal, with a rubber or other pad so adjusted as to make the block or tube water-tight and to prevent the leakage of the contents in case of breaking of the glass. When inclosed in a tin cylinder, metal case or tube, such cylinder, case or tube should have a screw-lid with a rubber or cork cushion inside in order to make the same water-tight, and should be securely fastened in a wooden or papier-mache block (open only at one end), and not less in thickness and strength than above prescribed. Manufacturers or dealers intending to transmit articles or samples in considerable quantities, should submit a sample package, showing their mode of packing, to the Postmaster at the mailing office, who will see that the conditions of this section are carefully observed.

Note D.

THIRD CLASS MATTER—PREPAYMENT.—Postage must be fully prepaid, otherwise the matter will be "held for postage." The rate is *one cent for every two ounces or fraction thereof. The limit of weight is* 4 pounds, except on single books. WRITING.—No writing is permitted on Third Class matter, except as follows: The name and address of the sender on the outside or inside of package, preceded by the word "From," and any printing not in the nature of personal correspondence. The sender is further allowed to mark a word or passage in a book or paper to which he desires to call special attention. He may also write a simple inscription or dedication upon the cover or blank leaf of a book or pamphlet. The date, address and signature of a circular may be written. Any other writing on Third Class matter will subject the package to letter rates of postage, and may render the sender liable to a fine of ten dollars. *Photographs* and *blue prints* must bear no other writing than the name of the sender.

WRAPPING.—Mail matter of the Third Class must be so wrapped or inclosed that it can be readily examined without destroying the wrapper; otherwise it will be subject to postage at the First Class rate (two cents per ounce), as will all articles inclosed in sealed envelopes with clipped ends, sides or corners, or in boxes with covers secured by nails, and all packages the wrappers of which are secured to the inclosure by postage stamps.

Note E.

FIRST CLASS.—This class includes letters, postal cards, sealed packages, all matter wholly or partly in writing (whether manuscript or produced by type-writer or copying press), drawings, designs, plans and maps, if they contain descriptive words, letters or figures in writing, produced by hand, manuscript for publication not accompanied by proof-sheets, and all personal correspondence, whether in writing or in print. (See under heads "Third Class," "Fourth Class," notes "A" and "D," certain writing permitted in or on articles of those classes.)

The rate of postage on mail matter of the First Class (sealed or unsealed) is *two cents for each ounce or fraction thereof*, excepting postal cards, and excepting also letters for *local delivery* posted at the post-offices where no letter-carriers are employed, in which case the rate is *one cent per ounce or fraction thereof.*

The law provides that the postage on all mail matter of the First Class shall be prepaid only by postage stamps or by inclosure in government



"MINNIE ASHLEY."
By B. J. FALK.

stamped envelopes, and that any article of this class (not entitled by law to free transmission in the mails) deposited in a post-office wholly unpaid or prepaid *less than one full rate, cannot be forwarded or delivered*, but must be "held for postage." LIMIT OF WEIGHT.—There is no limit to the weight of letters or packages of First Class matter. WRAPPING OR ENCLOSURE.—Mail matter of the First Class may be wrapped or enclosed in any manner that the sender may desire. RETURN.—Letters not delivered will be returned to writer free, if a request to that effect is placed on the envelope. FORWARDING.—A letter will be forwarded by the Postmaster who may hold it, to another post-office, at the request of the person to whom the letter is addressed. Letters addressed to the care of another person, or erroneously delivered, may be redirected and returned within a reasonable time to post-office, and will be forwarded without additional charge.

The putting on of requests to return the matter to the sender in case of non-delivery is recommended by the Post-Office Department—not on first-class alone, but on all matter.

Note F.

POSTAL CARDS.—No cards are "Postal Cards" except those issued by authority of the Postmaster-General (the imitation of which is forbidden and punished by law); and so-called "Postal Cards" issued by private parties are subject to letter rates of postage when they contain any written matter whatever in addition to the date, and the name of the addressee and of the sender, and the correction of mere typographical errors herein. Nothing whatever may be attached to a Postal Card except an address label, which may be pasted to the *address side*, and no printing or writing is permitted upon the address side of Postal Cards, except that imprinted thereon at the manufactory and such as may be necessary for the proper direction of the same. Postal Cards are unmailable as such when incomplete or mutilated, and in all cases where any of the above conditions are not complied with. Undelivered single Postal Cards are not returned to senders.

Note G.

PROOF SHEETS may be corrected or uncorrected, with or without the original manuscript, additions to or alterations in the matter, or directions as to the typographical part of the work; but directions in writing as to binding, quality of paper, etc., are not permissible unless the letter rate of postage be paid.

Note H.

CANADA AND MEXICO.—Matter mailed in the United States, addressed to Mexico, is subject to the same postage rates and conditions as it would be if it were addressed for delivery in the United States, except that articles of miscellaneous merchandise (fourth-class matter) not sent as *bona-fide* trade samples, are required to be sent by "Parcels Post," and that the following articles are *absolutely excluded* from the mails without regard to the amount of postage prepaid, or the manner in which they are wrapped, viz.:

All sealed packages, other than letters in their usual and ordinary form; *all* packages (including packages of second-class matter, which weigh more than 4 pounds 6 ounces), except such as are sent by "Parcels Post;" liquids, pastes, confections and fatty substances; publications which violate any copyright law in Mexico.

Single volumes of printed books in *unsealed* packages, are transmissible to Mexico in the regular mails without limit as to weight.

"*Commercial Papers*," and *bona-fide* trade samples are transmissible to Mexico in the regular mails at the postage rate given above, opposite "Commercial Papers" and "Samples of Merchandise," respectively. See also Note 14, pp. 925 and 927 of the *United States Official Postal Guide* for January, 1894.

Matter mailed in the United States, addressed to Canada, is subject to the same postage rates and conditions as it would be if it were addressed for delivery in the United States, except that "Commercial Papers" are transmissible at the postage rate given above opposite "Commercial Papers"; that packages of seed, plants, etc., are subject to the postage rate of one cent per ounce, and that the following articles are *absolutely excluded* from the mails, without regard to the amount of postage prepaid, or the manner in which they are wrapped, viz.:

All sealed packages, other than letters in their usual and ordinary form; *all* packages (except single volumes of printed books and packages of second-class matter), which weigh more than 4 pounds 6 ounces; Police Gazettes; publications which violate any copyright law of Canada.

UNITED STATES POSTAL AGENCY AT SHANGHAI, CHINA.—Articles addressed for delivery at the following places in China, viz.: Cheefoo (or Yenti), Chin Kiang, Chung King, Kaiping, Kalgan, Kiukiang, Nanking, Newchwang, Ningpo, Ourga, Peking, Hang Chow, Hankow, Ichang, Shanghai, Taku, Tientsin, Wenchow, Wuchang, Wuhu, are transmissible in the mails made up in San Francisco for the United States Postal Agency at Shanghai. See "Shanghai" in the Foreign Postage Table on page 20.

Note 1.

REGISTRATION.—All kinds of mail matter can he registered at the rate of eight cents for each package, in addition to the postage at regular rates, both postage and fee to be fully prepaid by stamps; all conditions as to marks, contents and method of securing packages being the same as described under the various classes (Notes A, D, E). Each package must bear name and address of sender, and a receipt will be returned from the person to whom addressed.

DOMESTIC MONEY ORDERS.

For Orders not exceeding						$0 03
"	exceeding	$2.50	and not exceeding		$5.00...	05
"	"	5.00	"	"	10.00...	08
"	"	10.00	"	"	20.00...	10
"	"	20.00	"	"	30.00...	12
"	"	30.00	"	"	40.00...	15
"	"	40.00	"	"	50.00...	18
"	"	50.00	"	"	60.00...	20
"	"	60.00	"	"	75.00...	25
"	"	75.00	"	"	100.00...	30

(Postal Notes no longer issued.)

INTERNATIONAL MONEY ORDERS.

The fees for International Money Orders are as follows:

For sums not exceeding $10.....	$0 10	Over $50 and not exceeding $60.....	$0 60				
Over $10 and not exceeding $20.....	20	" 60 " " 70.....	70				
" 20 " " 30.....	30	" 70 " " 80.....	80				
" 30 " " 40.....	40	" 80 " " 90.....	90				
" 40 " " 50.....	50	" 90 " " 100.....	1 00				

The sender of a money order must state the particulars thereof upon a form furnished by the post-office.

A money order may be endorsed once only.

The person who presents a money order for payment must be identified if unknown to the postmaster, unless the remitter upon his application waives identification.

A domestic money order may be repaid within a year at the office of issue. The fee will not be refunded.

Duplicates of lost or invalid money orders are issued by the department free of charge upon application made through the issuing or paying postmaster by remitter, payee or indorsee.

The issue of money orders on credit is prohibited.

A money order may be paid to a second person by endorsement of payee, or upon a written order or power of attorney to be filed with the paying postmaster.

A duplicate cannot be obtained of a postal note lost or destroyed.

An invalid postal note, that is, one not paid within three months from the last day of month of issue, will be replaced at an extra charge of three cents, by a duplicate issued by the department, to be applied for through the postmaster at any money order office. The invalid note must accompany the application.

International money orders may be drawn for payment in the following countries and places:

Order Should be Sent by Remitter to Payee.

Alexandria, Egypt, if drawn as a French order.
Algeria.
Amoy, China.
Bahama Islands.
Bermudas.
Beyroot, Turkey, if drawn as a French order.
British Bechuanaland, South Africa.
British Guiana.
Canada.
Canton, China
Cape Colony, South Africa.
Constantinople, Turkey, if drawn as British or French.
Foochow, China.
France.
Great Britain and Ireland.
Hankow, China
Hawaiian Islands.
Hoihow, China.
Hong Kong, China.
Jamaica.
Leeward Islands.
Newfoundland.
New South Wales.
New Zealand.
Ningpo, China.
Orange Free State, South Africa.
Panama.
Port Said, Egypt.
Queensland.
Salonica, Turkey, if drawn as a French order.
Shanghai, China.
Smyrna, Turkey, if drawn as a French order.
South Australia.
Swatow, China.
Tasmania
Transvaal, South Africa.
Tripoli, Africa.
Tobago, West Indies
Tunis, Africa.
Trinidad, West Indies.
Victoria, Australia.
Windward Islands.
Zanzibar, Africa, if drawn as a French order.

Order May be Kept by Remitter as a Receipt.

Accra, Gold Coast, Africa.
Aden, Arabia.
Adrianople, Turkey.
Alexandria, Egypt, if drawn as a British order.
Archipelago of Banca, Dutch East Indies.
Archipelago of Billiton, Dutch East Indies.
Archipelago of Riouw, Dutch East Indies.
Assab, Africa.
Austria-Hungary.
Azores.
Bagdad, Turkey.
Banana, Congo Free State.
Bassorah, or Basra, Turkey.
Bathurst, Gambia, Africa.
Belgium.
Belize, British Honduras.
Beluchistan, Asia.
Bermuda.
Beyroot, Turkey, if drawn as British or Austrian.
Boma, Congo Free State.
Borneo.
Bosnia.
British Honduras.
Bulgaria.
Bunder Abbas or Gombroon, Persia.
Burmah, Asia.
Bushire, or Abu'-Shehr, Persia.
Caipha (or Haifa), Turkey.
Cameroons, Cameroons, Africa.
Candia, Crete, Turkey.
Canea, Crete, Turkey.
Cape Coast Castle, Gold Coast, Africa.
Celebes.
Ceylon.
Constantinople, Turkey, if drawn as Austrian.
Cyprus.
Danish West Indies.
Dar es Salaam, Africa.
Denmark.
Durazzo, Turkey.
Egypt.
Falkland Islands.
Faroe Islands.
Gambia, Africa.
Germany.
Gibraltar.
Gold Coast Colony, Africa.
Guadur or Gwadel, Beluchistan.
Heligoland.
Herzegovina.
Iceland.
India, British.
Italy.
Jaffa, Turkey.
Japan.
Java.
Jask, Persia.
Jerusalem, Turkey.
Kerassunde, Turkey.
Kilwa, Africa.
Klein-Popo, or Little Popo, Togo, Africa.
Lagos, Africa
Labuan, Borneo.
Lamu, Africa.
Lindi, East Africa.
Linga, or Lingor, Persia.
Little Popo, or Klein-Popo, Togo, Africa.
Lome, Togo, Africa.
Luxemburg, Grand Duchy.
Madeira Islands.
Madura, Dutch East Indies
Malacca, Straits Settlements.
Malta.
Massowah, Africa
Matadi, Congo Free State.
Mauritius.
Mitylene, Turkey.
Molucca Islands.
Mombasa, Africa.
Muscat, Arabia.
Natal, South Africa.
Netherlands.
North Borneo, Sandakan.
Norway.
Panzani, Africa.
Penang, Straits Settlements.
Portugal.
Previsa, Turkey.
Retimo, Crete.
Rhodes, Turkey.
Roumania.
Saadani, East Africa.
Saint Helena.
Salonica Turkey, if drawn as British or Austrian.
Salt Pond, Gold Coast.
Salvador, Central America.
Samsun, Turkey.
Sandakan, Borneo.
Sant Quaranta, Turkey.
Sarawak, Borneo.
Scio, Chios, Turkey.
Seychelle Islands.
Sierra Leone, Africa.
Singapore, Straits Settlements.
Smyrna, Turkey, if drawn as Austrian.
Straits Settlements.
Sweden.
Switzerland.
Tanga, Africa.
Tangier, Morocco.
Trebizond, Turkey.
Turk's Island, West Indies.
Valona, Turkey.
Victoria, Cameroons, Africa.
Western Australia.
Zanzibar, Africa, if drawn as a British order.

RATES OF POSTAGE TO FOREIGN COUNTRIES.

UNIVERSAL POSTAL UNION.

Treaty concluded at Vienna, Austria, July 4, 1891.

	Cts.
Letters, per 15 grams or ½ ounce (prepayment optional, except to places marked *).	5
Postal Cards, each	2
Postal Cards, with paid reply, each	4
Commercial papers, { First 10 ounces or fraction thereof	5
{ Every additional 2 ounces	1
Samples of merchandise, { First 4 ounces	2
{ Every additional 2 ounces	1
Registration Fee on letters or other articles	8

All correspondence other than letters must be prepaid at least partially.

†Correspondence paid to British Indian Frontier only.

INTERNATIONAL MONEY ORDERS are issued only to Countries or Places marked ¶.

COUNTRIES OR PLACES WHICH, WITH THE UNITED STATES, ARE COMPRISED IN THE UNIVERSAL POSTAL UNION, AND TO WHICH THE ABOVE RATES APPLY.

(*The Italics in brackets represent the Nationality of Foreign Possessions.*)

Abyssinia, East Africa.
Aden, Arabia, British P. O.
Africa (W. C.) Br. Colonies.
Africa (Fr. Port. & Sp. pos.)
Ajuda, Africa. (*Portuguese*)
Algeria, Africa. (*French.*)
Algiers, Africa. (*French.*)¶
Alhucemas, N. Africa. (*Sp.*)
Amar, Asia. (*Spanish.*)
Amirante Islands, E. Africa.
Amoy, Hong Kong P. O.
Andorra, Rep. of (*Spain.*)
Angola, Africa. (*Portug'se.*)
Annobon Isl'd., Africa. (*Sp.*)
Antigua, Isl'd. W.I. (*British*)
Aracan, British India.
Argentine Republic.
Aruba, S. America. (*Dutch.*)
Asia (Dch., Fr., Pr. & Sp. Col.)
Colon, U. S. of Colombia.
Assinie, Africa. (*French.*)
Austria-Hungary.¶
Azores Islands. (*Port.*)¶
Bahama Islands. (*British.*)
Bakel, Africa. (*French.*)
Balearic Isles. (*Spanish.*)
Bali, Asia. (*Dutch.*)
Banca, Asia. (*Dutch.*)
Barbadoes, W. I. (*British.*)¶
Barbary (Tunis & Tripoli.)
Batavia, Java, Asia. (*Dutch.*)
Bay Islands, Sp. Honduras.
Belgium.¶
Bermuda Islds., W. I. (*Br.*)
Bien-Hoa, Coch.-China. (*Fr*)
Billiton, Asia. (*Dutch.*)
Bissao, Africa. (*Portug'se.*)
Bogota, U.S. of Colombia.
Bolivia, South America.
Bonaire Islds., W.I. (*Dutch.*)
Borneo, Asia. (*Dutch.*)
Bourbon, Isld., Africa. (*Fr.*)
Brazil, South America.
Bulgaria, Principality of.
Burmah, British India.
Cabul, Afghan, *via* Italy.*†
Cacheo, Isld., Africa. (*Port*)
Cambodia, Fr. P. Offices in.
Cameroons (or Kameroun), West Africa.
Canary Islands. (*Spanish.*)
Canton, Hong Kong, P. O.
Cape Verde Is., Afr. (*Port.*)
Caroline Is., Oceanica. (*Sp.*)
Carthagena, U. S. Colombia.
Casablanca, Morocco. (*Sp.*)
Celebes, Asia. (*Dutch.*)
Ceuta, N. Africa. (*Spanish.*)
Ceylon. (*British.*)
Chaffarine Is., N. Afr. (*Sp.*)
Chandernagore, India. (*Fr.*)
Chili, South America.
China, *via* Russia.
China, *via* Hong Kong.
China, *via* France.
Cochin China (French Col.in)
Colombia (U.S. of) S. Amer.
Comino, Malta. (*British.*)
Cominotto, Malta. (*British.*)
Congo (State of) W. Africa.
Constantinople, Turkey.¶
Corisco Is., Africa. (*Sp.*)
Costa Rica, Cent'l America.
Cuba, W. I. (*Spanish.*)
Curacoa Is., W.I. (*Dutch.*)
Cyprus Island, (*British.*)
Dagana, Senegal. (*French.*)
Damao, Asia. (*Portuguese.*)
Denmark.¶
Desirade Isld., W. I. (*Fr.*)
Diu, Asia. (*Portuguese.*)
Dominica Isld., W. I. (*Brit.*)
Dominica, Rep. of, W. I.
East Africa, Ger. Protectorate.
Ecuador, S. America. [ate.
Egypt, Africa.¶
Falkland Is., S. Amer. (*Br.*)
Faroe Islands, Denmark.
Fernando Po. Is., Afr., (*Sp.*)
Finland, Gr. Duchy, Russia.
Flores, Asia. (*Dutch.*)
Foo-chow, Hong Kong P. O.
Formosa, *via* Hong Kong.
France.¶
French Colonies, all.
Fusam-po, Corea, Jap. P.O.
Gaboon, Senegal. (*French.*)
Gambia, W. Africa. (*Br.*)
Gambier, Is., Oceanica. (*Fr.*)
Genzanshin, (Corea.) Japa-
Germany.¶ [nese P. O. at.
Gibraltar, Spain. (*British.*)
Goa, Asia. (*Portuguese.*)
Gold Coast, W. Africa. (*Br.*)
Goree, Senegal. (*French.*)
Gozzo, Malta. (*British.*)
Grand Bassam, W. Afr. (*Fr.*)
Great Britain.¶
Greece.
Greenland, N. America.
Grenada, Isld., W. I. (*Br.*)¶
Grenadines Is., W. I. (*Br.*)
Guadeloupe Is., W. I. (*Fr.*)
Guadur, British India.
Guatemala, Centr. America.
Guiana, Br., Fr. and Dutch.
Hankow, Hong Kong P. O.
Hawaii, Sandwich Islands.¶
Hayti, Isld., W. I.
Hatien, Cochin China. (*Fr.*)
Heligoland Isld., Germany.
Hindostan, British India.
Hoihow, Hong Kong P. O.
Holkar, Br. Ind. *via* Italy.†
Honduras, Br. C. America.
Honduras, Rep. C. America.
Hong Kong, China.¶
Hungary.
Hyderabad, Ind., *via* Italy.*†
Iceland Isld., Denmark.
India, British.¶
India (French Est'blish'ts in)

RATES OF POSTAGE TO FOREIGN COUNTRIES—*Continued.*

Ionian Isles, Greece.
Ireland.¶
Isle of Pines, Oceanica. (*Fr.*)
Italy.¶
Jamaica, Isld., W. I. (*Br.*)¶
Japan, Asia.¶
Java, Batavia, Asia (*Dutch*).
Jinsen (Corea), Jap. P. O. at
Kalgan, China, *via* Russia.
Kameroun.
Karakal, India. (*Fr.*)
Kashmir, Ind., *via* Italy.*†
Kiung-Chow, H'g K'g P. O.
Labrador.
Labuan, Philippine Isl. (*Br.*)
Ladakh, Thibet, *via* Italy.*
Ladrone Is., Oceanica (*Sp.*)
Lagos, W. Africa (*Br.*)
Larrache, Morocco. (*Span.*)
Les Saintes, Is., W. I. (*Fr.*)
Leeward Is., W. I. (*Br.*)
Liberia, Africa.
Lichtenstein, Princ. Austria.
Lombok, Asia. (*Dutch.*)
Low Islds., Oceanica. (*Fr.*)
Loyalty Is., Oceanica (*Fr.*)
Luxemburg (Gr. Duchy of).¶
Luzon, Philippine Is. (*Sp.*)
Macao Hong Kong P. O.
Macassar, Asia. (*Dutch.*)
Madagascar Isls., Afr. (Ste. Marie, Tamatave, Majunga and Ambositra, Andevorante, Fenerive, Fiaranantsoa, Foulpointe, Ivondro, Maevatanana, Mahambo, Mahanoro, Mahela, Maintirano, Mananjary, Morondava, Morotsangana, Nossi-Vé, Tananarive [also known as [Antananarivo, Vatomandry, Vohemar.
Madeira, Isld., Portugal.¶
Madura, Asia. (*Dutch.*)
Mahe, India. (*French.*)
Malacca Straits Sett's. (*Br.*)
Malta, Isld. (*British.*)
Mandalay, Br. Indian P. O.
Manila, Philippine Isls. (*Sp.*)
Mariana Is., Oceanica. (*Sp.*)
Marie Galante, Is.,W. I. (*Fr.*)
Marquesas Is., Oce'ca. (*Fr.*)
Marshall Islands, Ger. Pro.
Martinique Is., W. I. (*Fr.*)
Massowah, R. Sea (It. P. O. at)
Mauritius Is., Africa. (*Br.*)
Mayotte, W. Africa. (*Fr.*)
Mazagan, Morocco. (*Span.*)
Melilla, N. Africa. (*Span.*)
Mindanao, Philip'ne Is. (*Sp.*)
Miquelon, Is., N. Am. (*Fr.*)
Mogador, Morocco (*Sp.*)
Moldavia, Roumania.
Moluccas, Asia. (*Dutch.*)
Monaco, Princip. of France.
Montenegro.
Montserrat, W. I. (*British.*)
Morocco, Fr. & Sp. P. O. in.
Mozambique, Africa. (*Port.*)
Muscat, British Indian P. O.
Mysore, Br. Ind., *via* Italy.†
Mytho, Cochin China. (*Fr.*)
Nassau, N. P. Bahamas. (*Br.*)
Natal, Africa, Brit. Col. of.
Navigators Islands. (Ger. P. O. at Apia.)
Netherlands.¶
Netherland Colonies in Asia, America and Oceanica.
Nevis, Isld., W. I. (*British.*)
New Caledonia, Ocean. (*Fr.*)
Newfoundland.
New Guinea, Oce'ca. (*Dutch.*)
New Guinea Company, Territory of, Ger. Pro.
New South Wales, including Lord Howe Island and Norfolk Island.
New Zealand, including Chatham Islands.
Nicaragua, Centr. America.
Ning-po, Hong Kong, P. O.
Norway.¶
Nossi be, W. Africa. (*Fr.*)
Nubia, Egypt.
Obock, East Coast of Africa (French P. O. at.)
Ourga, China, *via* Russia.
Palawan, Philip'ne Is. (*Sp.*)
Panama, U. S. of Colombia.
Panay, Philip'ne Isl. (*Sp.*)
Papua, Oceanica. (*Dutch.*)
Paraguay, S. America.
Patagonia, S. America.
Pegu, British India.
Pekin, China, *via* Russia.
Penang, Straits Settlts. (*Br.*)
Penon de Gomera, N. Af. (*Sp.*)
Persia, Asia.
Persian Gulf, Br. Ind. P. O.
Peru.
Philippine Is., Ocea. (*Sp.*)
Pines, Isle of, Oceanica.
Pondicherry, India. (*Fr.*)
Porto Rico, W. I. (*Span.*)
Portugal.¶
Port. Col'o's, Asia & Africa.
Poulo-Condor, C. China. (*Fr.*)
Prince, Isld., Africa. (*Port.*)
Queensland.
Rabat, Morocco, Spa. P. O.
Reunion Isld., Africa. (*Fr.*)
Rhio-Riouw, Asia. (*Dutch.*)
Rodrigues Is., Africa. (*Br.*)
Roumania.
Russia.
Saba Islds., W. I. (*Dutch.*)
Saffi, Morocco, Span. P. O.
Saigon, Cochin China. (*Fr.*)
Salvador, Central America.
Samoan Islands (Ger. P. O. at Apia.)
Sandwich Islds., Oceanica.
San Domingo Republic, W. I.
San Marino Republic, Italy.
Senegal, W. Africa. (*Fr.*)
Senegambia, W. Africa. (*Br.*)
Servia.
Seychelles, Is., Africa. (*Br.*)
Shanghai (U. S. Postal Agency at.)
Shanghai, *via* Hong Kong.
Shanghai, *via* France.
Siam, Asia.
Sierra Leone, W. Af. (*Br.*)
Singapore, Asia. (*British.*)
Soudan, Egypt.
South Australia.
S. W. Africa, Ger. Pro.
Spain.
Spanish Colonies in Asia, Africa, America & Oce'ca.
St. Bartholomew, Is'ld, W. I. (*French.*)
St. Christopher I., W. I. (*Br.*)
St. Croix Isl., W. I. (*Dan.*)
St. Domingo, Republic, W. I.
St. Eustatius Is., W. I. (*Dut.*)
St. John Is., W. I. (*Dan.*)
St. Kitts Is., W. I. (*Br.*)
St. Lucia Is., W. I. (*Br.*)¶
St. Louis, W. Africa. (*Fr.*)
Ste. Marie Madagasc'r. (*Fr.*)
St. Martin, W. I. (*Fr.& Dut.*)
St. Pierre, W. I. (*French.*)
St. Thomas Is. W. I. (*Dan.*)
St. Thome Is.. Afr. (*Port.*)
St. Vincent, W. I. (*Br.*)¶
Staten Island, S. America.
Straits Settlem'ts, Asia. (*Br.*)
Sumatra, Asia. (*Dutch.*)
Sumbawa, Asia. (*Dutch.*)
Surinam, S. America. (*Dut.*)
Swatow, Hong Kong P. O.
Sweden.¶
Switzerland.¶
Tahiti Isld., Oceanica. (*Fr.*)
Tamatave, Madagasc'r. (*Fr.*)
Tangier, F. & Span. P. O.
Tasmania.
Tenasserim, British India.
Terra del Fuego.
Tetuan, Morocco, Sp. P. O.
Tien-Tsin, China, *via* Russia.
Timor, Asia. (*Dut. & Port.*)
Tobago Isld., W. I. (*Br.*)¶
Togo, W. Africa, Ger. Pro.
Tonquin (French P. O. in.)
Toubouai, Oceanica. (*Fr.*)
Trinidad Isld., W. I. (*Br.*)
Tripoli (Italian P. O. at.)
Tschandok, Co. China. (*Fr.*)
Tuamotou, Oceanica. (*Fr.*)
Tunis, (Fr. and Italian P. O.)
Turkey—Europe and Asia.
Turk's Island, W. I. (*Br.*)
Uruguay, S. America.
Venezuela, S. America.
Victoria.
Vingh-Long, C. China. (*Fr.*)
Virgin Isles, W. I. (*British.*)
Wallachia, Roumania.‡
West Indies.
Western Australia.
Yanaon, India. (*French.*)
Zanzibar, Afr., *via* Aden.*

*Regarding exceptions, see Note H., p. 406.

COUNTRIES IN UNIVERSAL POSTAL UNION WITH WHICH THE UNITED STATES HAS SPECIAL CONVENTIONS.

Canada, comprising Provinces of *British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario, Prince Edward Island, Quebec,* and *North West Territories*.....
Mexico.....

Limit of letter weight 30 gr. or 1 oz.; *postage-rates* on all classes of mail matter; the United States domestic rates; except seeds, plants, etc., for Canada, the rate upon which is 1 cent per oz.

COUNTRIES OR PLACES NOT IN UNIVERSAL POSTAL UNION.

Prepayment is compulsory.
† The limit of payment is at port of debarkation ; for all other places, to destination
‡ Samples are not accepted for these destinations.
§ Registration is allowed on letters and other articles. Fee, 10 cents.
‖ Registration is allowed *only* on letters. Fee, 10 cents.
¶ Money orders are issued at same rates as specified at top of page 381.
Postal cards cannot be sent from the United States to any of the following places *except* Canada.

COUNTRIES OR PLACES OF DESTINATION.	Per 15 Grams, or ½ Ounce.	Newspapers.		Other Printed Matter, Samples and "Commercial Papers."	
		Limit for Single Rate.	Postage for Single Rate.	Limit of Weig	Postage for Single Rate.
	Cts.	Oz.	Cts.	Oz.	Cts
Africa, except Egypt, Liberia, Congo, the Transvaal, British, French, Spanish and Portuguese Colonies, the Territories of South-West Africa, and of Togo, Western Africa (German Protectorates), Tunis, and the European post-offices in Morocco, Abyssinia, and Madagascar, by British Mail.....†	10	2	2	2	
Ascension Island, S. Atlantic, British Mail...	10	2	2	2	
Basutoland, *see* Cape Colony.					
Bechuanaland, S. Africa, British Mail.....§	10	no	2	2	2
Caffraria, *see* Cape Colony.					
Cape Colony, S. Africa, British Mail.....§¶	10	2	4	2	2
China, British Mail, *via* Brindisi.....§	10	2	2	2	2
Comoro Islands (except Mayotte) Mozambique Channel.....	5	no	2	2	1
Fiji Islands, *via* San Francisco and Sydney.....†‡	5	no	2	2	2
Griqualand, *see* Cape Colony.					
Kimberly, *see* Cape Colony.					
Madagascar, except St. Marie, Tamatave, Majunga and Amboisitra, Andevorante, Fenerive, Fiaranantsoa, Foulpointe, Ivondro, Maevatanana, Mahambo, Mahanoro, Mahela, Maintirano, Mananjary, Morondara, Nossi-Vé, Tananarive, Vatomandry, Vohemar, by British Mail.....†	10	2	2	2	2
Morocco, except Spanish Possessions on West Coast.....†	10	2	2	2	2
Navassa, West Indies, direct mail.....‡‡	5	no	2	2	2
Navigator's Islands, Pacific‡‡	5	no	2	2	2
Orange Free State, *see* Cape Colony.					
Pitcairn Island, Pacific (*no registration.*)‡‡	5	no	2	2	2
St. Helena, South Atlantic, British Mail.....§	10	2	2	2	2
Samoan Islands, *see* Navigator's Islands.					
Shanghai, direct, *via* San Francisco.....‡‖	5	no	2	2	2
Transvaal, South Africa. British Mail.....§	10	no	2	2	2

PARCELS POST.

STATEMENT SHOWING THE COUNTRIES TO WHICH PARCELS MAY BE SENT; THE DIMENSIONS, WEIGHT AND RATES OF POSTAGE APPLICABLE TO PARCELS, AND THE EXCHANGE POST OFFICES WHICH DISPATCH AND RECEIVE PARCELS POST MAILS.

Names of Countries.	Allowable Weight of Parcels.				Postage.		Exchange Post Offices.	
	Greatest Length.	Greatest Length and Girth Combined.	Greatest Girth.	Greatest Weight—Pounds.	For a Parcel not exceeding 1 Pound.	For every additional Pound or fraction of a Pound.	United States.	Foreign.
Bahamas	3 feet 6 inches.	6 feet.		11	12 cts.	12 cts.	New York.	Nassau.
Barbadoes	3 " 6 "	6 "		11	12 "	12 "	"	Bridgetown.
Colombia	2 "		4 feet.	11	12 "	12 "	All offices authorized to exchange mails between the two countries.	
Costa Rica	2 "		4 "	11	12 "	12 "		
The Danish West Indies	3 " 6 "	6 feet.		11	12 "	12 "		
The Hawaiian Kingdom	3 " 6 "	6 "		11	12 "	12 "	San Francisco.	Honolulu.
Honduras (British)	3 " 6 "	6 "		11	12 "	12 "	New Orleans.	Belize.
Jamaica	3 " 6 "	6 "		11	12 "	12 "	New York.	Kingston.
Leeward Islands	3 " 6 "	6 "		11	12 "	12 "	"	St. John, Antigua.
Mexico	2 "		4 feet.	11	12 "	12 "	All offices authorized to exchange mails between the two countries.	
Salvador	3 " 6 "	6 feet.	. ..	11	12 "	12 "		
Guiana (British)	3 " 6 "	6 "		11	12 "	12 "		
Windward Islands	3 " 6 "	6 "		11	12 "	12 "		
Newfoundland	3 " 6 "	6 "		11	12 "	12 "	New York, Philadelphia.	St. John's, N. F.

AMERICAN PHOTOGRAPHIC SOCIETIES.

NOTE. The particulars of the Societies marked * are reprinted from last year's Annual, no notice having been taken by the secretaries to repeated applications for up-to-date information. Many are probably out of existence. We shall be glad of any particulars.

AGASSIZ ASSOCIATION, PHOTOGRAPHIC SECTION OF THE MANHATTAN CHAPTER, NEW YORK CITY.—Organized 1881. *President*, C. F. Groth; *Vice-President*, C. Kromm; *Board of Trustees*, C. F. Groth, E. B. Miller, W. S. Miller, H. T. Rowley, E. Staubrandt, H. Breunich, F. C. Truhan, Miss M. Miller, Miss M. Hargrove; *Treasurer*, W. S. Miller; *Librarian*, Miss K. Hargrove; *Cor. Secretary*, Ed. B. Miller, 141 East 40th Street, New York. Place of meeting, 141 East 40th Street. Ordinary meetings, once a month as announced. Special meetings on call of Trustees. Annual meeting, first meeting January. Membership September 1: 30.

*AKRON CAMERA CLUB.—Akron, Ohio. Organized November 10, 1890. *President*, Ed. A. Terrass; *Vice-President*, Henry Canfield; *Executive Committee*, Prof. Charles Knight, Prof. Wm. D. Shipman, Henry Canfield; *Treasurer*, F. H. Adams; *Secretary*, Margaret Mitchell, 150 South Summit Street, Akron, Ohio. Place of meeting, homes of members. Ordinary meetings, second Tuesday of the month, 7.30 P.M. Special meetings at discretion of the President. Annual meeting, first or second week in June. Membership September 1: Active 15. Publications: the minutes are published in daily paper day after the meetings. Exhibitions: private exhibitions once a month; public exhibitions at the discretion of the Executive Committee. The Club is doing very active work—are having outings every two weeks.

ALBANY CAMERA CLUB.—72 Chapel Street, Albany, N. Y. Organized October 21, 1887. *President*, W. W. Byington; *Vice-President*, Wait H. Stillman; *Directors*, J. S. Paterson, Chas. H. Pease, J. S. Van Buren, Prof. Perkins, G. H. Russell, T. C. Leutze, Dr. S. B. Ward, Chas. W. Reynolds. *Treasurer*, Edward D. Mix; *Librarian*, Dr. Chas. E. Davis; *Secretary*, Charles B. Tillinghast, 72 Chapel Street, Albany, N. Y. Place of meeting, Club House. Ordinary meetings, first Friday in each month, at 8 P.M. Annual meeting, first Friday in April. Membership September 1: Active, 60; associate, 103; total, 163. Exhibitions: a print exhibition is held in March or April of each year.

*ALLENTOWN Y. M. C. A. CAMERA CLUB.—Allentown, Penn. Organized 1895. *President*, Arnold R. Lewis; *Vice-President*, Chas. H. Rochel; *Treasurer*, A. K. Krauss; *Secretary*, J. K. Bowen; *Instructor*, Rev. S. U. Mitman.

AMATEUR PHOTOGRAPHIC ASSOCIATION.—Selma, Ala. Organized December 27, 1887. *President*, William S. Monk; *Executive Committee*, S. A. Sexton; *Treasurer and Secretary*, S. Orlando Trippe. Place of meeting, 916 Broad Street, Selma, Ala. Ordinary meetings, first Thursdays in each month. Special meetings, call of President. Annual meeting, first Tuesday in January. Membership September 1: Active, 22.

AMERICAN INSTITUTE, PHOTOGRAPHIC SECTION.—New York City. Organized March 26, 1859. *President*, Oscar G. Mason; *Vice-President*, Robert A. B. Dayton; *Executive Committee*, officers of the section; *Treasurer*, William Dean; *Librarian*, Geo. Whitfield, Jr.; *Secretary*, J. W. Bartlett, M.D., 140 West 94th Street, New York City. Place of meeting, 113-115 West 38th Street. Ordinary meetings, first Tuesday of every month except July, August, September. Annual meeting, first Thursday in February. Membership September 1: all members of the Institute, above 1800. Exhibitions every Autumn.

AMERICAN LANTERN SLIDE INTERCHANGE.—Organized 1885. Incorporated 1893. *General Manager*, F. C. Beach, 36 Broadway, N. Y. City; *Assistant-Managers*, W. H. Rau, Will H. Olmstect; *Board of Managers*, F. C. Bierch, W. H. Rau, W. H. Olmstect, W. H. Cheney, John S. Paterson. Place of meeting, 361 Broadway, N. Y. City. Annual meeting, November 15 of each year. Membership September 1: 20 clubs and societies.

*AMERICA, PHOTOGRAPHIC ASSOCIATION OF—*President*, R. P. Bellsmith; 1*st* *Vice-President*, Geo. Steckel; 2*d* *Vice-President*, W. J. Root; *Treasurer*, G. M. Hayes; *Secretary*, J. Will. Kelmer. Annual Convention in 1897 at Chautauqua.

*AMERICAN LEAGUE OF AMATEUR PHOTOGRAPHERS.—Organized. New York, July 12, 1892. *President*, Paul L. V. Thiery; *Vice-President*, Dr. George L. Parmele of Hartford; Miss Francis B. Johnston of Washington, D. C.; *Executive*

Committee, Paul L. V. Thiery, Dr. George L. Parmele, Miss F. B. Johnston, W. S Drew, R. M. Fuller, T. J. Burton, Dr. James H. Stebbins, Jr., H. S. Fowler, O. S Teale, C. G. Hine; *Treasurer*, W. H. Drew, Lynn, Mass.; *National Delegate* R M. Fuller, Cranford, N. J.; *Secretary*, T. J. Burton, 113 West 38th Street. Place of meeting, 113 West 38th Street, New York. Annual meeting, second Tuesday in May. Membership September 1: Active, 1,253; total, 1,253. Publication, *The Developer*, monthly.

Officers of the New York Division: *President*, James H. Stebbins, Jr.. Society of Amateur Photographers, New York; *1st Vice-President*, Dr. Ely Van De Warker, Syracuse Camera Club; *2d Vice-President*, Frank La Manna, Brooklyn Academy of Photography; *Secretary and Treasurer*, H. S. Fowler, Brooklyn Academy of Photography.

Officers of the New Jarsey Division: *President*, Oscar S. Teale, President of the Plainfield Camera Club; *1st Vice-President*, William A. Halsey of the Newark Camera Club; *2d Vice-President*, A. J. Thomas, President of the Hoboken Camera Club; *Secretary and Treasurer*, R. M. Fuller.

*BALTIMORE CITY, THE PHOTOGRAPHIC CLUB OF.—Baltimore, Md., corner Madison and Eutaw Streets. Organized 1891. *President*, A. S. Murray; *Vice President*, Dr. Frank Slothower; *Directors*, A. S. Murray, Dr. Frank Slothower A. J. Godby, F. W. McAllister, E. M. Barker, B. G. Buck, Charles E. Needles; *Treasurer*, E. M. Barker; *Secretary*, Charles E. Needles, 404 Cathedral Street, Baltimore, Md. Place of meeting, 703 Madison Avenue, corner Madison and Eutaw Streets. Ordinary meetings, first Tuesday of the month, 8 P.M., club members, every Tuesday night. Annual meetings, first Tuesday in April, 8 P.M. Membership September 1: Honorary 1; active, 39; corresponding, 21; associate, 36; total, 78; Exhibition, usually monthly at Club Rooms.

*BETHLEHEM PHOTOGRAPHIC SOCIETY OF BETHLEHEM, PA.—Organized January 16, 1895. *President*, Prof. E. M. Hyde; *Vice-President*, Prof. H. S. Housekeeper; *Executive Committee*, E. H. Hyde, H. S. Housekeeper. C. F. Smith, E. A. Rau and F. E. Hammann; *Treasurer*, C. F. Smith; *Director of Lantern Interchange*, E. A. Rau; *Secretary*, F. E. Hammann. Place of meeting, at the homes of members. Ordinary meetings, third Tuesday in every month at 8 P.M., except July and August. Annual meeting, third Tuesday in January. Membership September 1: Honorary, 10; active, 15; total, 25. Exhibitions at frequent intervals; no definite date.

BOSTON CAMERA CLUB.—50 Bromfield Street, Boston, Mass. Organized 1881. *President*, George M. Morgan; *Vice-Presidents*, J. P. Loud, Charles Sprague, William O. Witherell; *Executive Committee*, George M. Morgan, Joseph Prince Loud, Charles Sprague, William O. Witherell, Chas. Hall Perry, Charles H. Chandler, Albert E. Schaaf, Francis H. Manning, Ernest O. Cockayne, Charles H. Currier, Edward R. Andrews, Rufus A. Bullock, Horace Packard; *Treasurer*, Charles H. Chandler; *Librarian*, Albert E. Schaaf; *Secretary*, Chas. Hall Perry. Place of meeting, 50 Brownfield Street, Boston, Mass. Ordinary meetings, first Monday of each month, except July, August and September. Special meetings on notice by the Secretary. Annual meeting first Monday in January. Membership September 1: Honorary, 9; active, 90; associate, 9; total, 108. Exhibitions: annually in April.

*BRIDGETON CAMERA SOCIETY.—47 and 48 E. Commerce Street, Bridgeton, N. J. Organized 1870. *President*, Henry A. Janvier, *Vice-President*, George Hampton; *Executive Committee*, Hugh L. Reeves, Sydney F. Bowen, Howard W. Zithian; *Treasurer*, Sydney E. Bowen; *Secretary*, Oscar F. Anderson, Bridgeton, N. J.; *Corresponding Secretary*, Henry W. Scull, Bridgeton, N. J., care of Cumb. Nat'l. Bank. Ordinary meetings, first Tuesday in each month, 8 P.M. Special meetings, on call from President. Annual meeting, first Tuesday in month of February. Membership September 1: Active, 40. Annual exhibitions each February.

BROCKTON CAMERA CLUB.—Brockton, Mass Organized April 16, 1894. *President*, Geo. W. Loring; *Vice-President*, Dr. J. F. Allen; *Executive Committee*, Geo. W. Loring, S. H. Eaton. W L. Puffer, F. N. Sherman, Robt. E. Brayton, Fred L. Packard; *Treasurer*, S. H. Eaton, *Librarian*, E. F. Stacy: *Secretary*, W. L. Puffer, Greene Street, Brockton, Mass. Place of meeting, No. 47 Center Street, Smith Building, Room 8. Ordinary meetings, third Friday every month Annual meeting third Friday in April. Membership September 1: Honorary, 2; active, 39; corresponding, 1; total, 42. Publications, "*Photo-Pyrotechnier*," monthly. Exhibitions: Public in January (regular).

BROOKLYN ACADEMY OF PHOTOGRAPHY.—177 Montague Street, Brooklyn. Organized 1885. *President*, August A. Goubert; *Vice-Presidents*, Wm. Dudley, Saml Baron; *Trustees*, officers and five others below: Dr. H. M. Lewis, C S. Reynolds, Starks W. Lewis, Frank La Manna, Dr. John Merritt; *Treasurer*, William T. Wintringham; *Librarian*, A. R. Pardington; *Secretaries*, Recording, Wm. Arnold, Corresponding, H. B. Fullerton, 177 Montague Street, Brooklyn. Place of meeting, 177 Montague Street, Brooklyn Ordinary meetings, every Monday, 8 P. M. Special meetings, call of five members. Annual meeting, first Monday in June. Exhibi-

tions: Regular Spring Print in May each year. Lantern—Public: three each winter; also specials in B. A. P. rooms. Smokers during the winter. Photo-bike runs in the summer.

BROOKLYN INSTITUTE DEPARTMENT OF PHOTOGRAPHY.—Brooklyn, N. Y. Organized 1889. *President*, J. Frederick Hopkins; *Vice-President*, Myers R. Jones; *2d Vice-President*, George W. Wundrum; *Treasurer*, S. D. Martens; *Curator*, Jas. W. Kent; *Reading-Secretary*, Henry L. Underhill; *Corresponding Secretary*, W. J. Bryant, Box 53, Brooklyn. Place of meeting, 201 Montague Street. Ordinary meetings, every Thursday. Annual meeting in May. Membership September 1, 279.

BUFFALO CAMERA CLUB.—Market Arcade, Buffalo, N. Y. *President*, John A. Stein; *Vice-President*, Conrad L. Baer; *Directors*, Dr. Bernard Bartow, John A. Stein, Edward C. Hawks, Conrad L. Baer, Harlow H. Boyce, Warren G. Sherk, John P. Zenner, Oscar H. Hanenstein, and Edward C. Reime; *Exhibition Manager*, Harlow H. Boyce; *Secretary and Treasurer*, John P. Zenner, 932 Genesee Street, Buffalo, N. Y. Place of meeting, Market Arcade. Ordinary meetings, first and third Fridays of each month. Special meetings, on call. Annual meeting, second Tuesday in October. Exhibitions: Second and fourth Friday evenings during the winter season.

BUFFALO RAMBLERS' BICYCLE CLUB, CAMERA SECTION OF.—Over 531 Main Street, Buffalo, N. Y. Organized August 30, 1893. *President*, Edward Raeker; *Vice-President*, Jos Strootman; *Executive Committee*, Edward Raeker, Conrad Baer, Jos. Strootman, Mark Berry; *Treasurer*, Mark Berry; *Secretary*, Chas. N. Moershfelder, 501 Main Street, Buffalo, N. Y. Place of meeting, Club Room of Buffalo Ramblers' Bicycle Club, over 531 Main Street. Ordinary meetings, first Wednesday every month. Special meetings at call of President and Treasurer. Annual meeting, first Wednesday in January. Membership September 1: Honorary, 2; active, 10; total, 12.

CALIFORNIA CAMERA CLUB.—819 Market Street, San Francisco, Cal. Incorporated April 5, 1890. *President*, W. B. Webstor; 1st *Vice-President*, I. E. Thayer; 2d *Vice-President*, E. W. Jensen; *Directors*, W. E. Goodrum, H. C. Cantwell, G. H. Knight, W. S. McClure; *Treasurer*, E. G. Eisen; *Librarian*, J. J. B. Argenti; *Secretary*, H. B. Hosmer, 819 Market Street, Room 58, San Francisco, Cal. Place of meeting, 819 Market Street, San Francisco. Ordinary meetings, first Tuesday after the first Monday of each month. Special meetings, at call of President, or at the written request of ten active members. Annual meeting, the regular meeting in April of each year. Exhibitions: Public Lantern Exhibitions monthly. Print Exhibitions yearly.

CAMERA CLUB.—111-115 W. 38th Street, New York City. Organized May 19, 1896. *President*, Dexter H. Walker; *Vice President*, William D. Murphy; *Trustees*, William J. Cassard, Louis B. Schram, William Bunker, Allen E. Churchill, John Aspinwall; *Treasurer*, Camille C. Roumage; *Librarian*, R. L. Bracklow; *Secretary*, Charles W. Canfield, 111-115 W 38th Street, New York City. Place of meeting, Club Room, 111-115 W, 38th Street, New York City. Ordinary meetings, second Tuesday every month (except July and August), 8.30 P.M. Special meetings on request of ten members. Annual meeting, second Tuesday in April. Membership September 1: Honorary, 18; active, 168; non-residents, 85; life, 16; total, 287. Publications, monthly except July and August. Exhibitions, annually; lantern-slides monthly; lantern-slide test nights, every Wednesday night throughout the year.

"CAMERADS"—New Brunswick, N. J. *President*, Prof. P. T. Austen; *Secretary*, Dr. H. Iredell, Lock Box 34, New Brunswick, N. J. Place of meeting, Rutger's College.

*CANADA, PHOTOGRAPHIC ASSOCIATION OF.—Organized 1883. *President*, A. M. Cunningham, Hamilton, Ont.; *Vice-President*, F. Cooper, London; J. Fraser Bryce, Toronto, W. F. Johnson, Picton; *Executive Committee*, Officers; *Secretary and Treasurer*, E. Poole, St Catharines, Ont. Place of meeting, Toronto. Annual meeting, November first and second. Membership September 1: Honorary, few. Exhibitions, October 31, November 1 and 2, Toronto.

CAPITAL BICYCLE CLUB, CAMERA CLUB OF THE.—409 Fifteenth Street, Washington, D. C. Organized October, 1891. *President*, Charles Richards Dodge; *Secretary and Treasurer*, Eugene Lee Ferguson. 1338 West Street, N. W., Washington, D. C. Place of meeting, Club House, 409 Fifteenth Street, N. W. Ordinary meetings, first and third Thursdays in each month. Meetings usually discontinued during summer. Special meetings at call of the President. All meetings at 8 o'clock P.M. Annual meeting, first Thursday in April. Exhibitions, annual lantern-slide exhibition in spring. Annual wall or easel exhibition of members' work was merged into the "Washington Salon and Art Photographic Exhibition" of 1896, which was open to the best exhibitors of North America. Projected for 1897: The National Photographic Salon. Date not fixed.

CAPITAL CAMERA CLUB.—401 Seventh Street, N. W., Washington, D. C. Organized May, 1891. *President*, Dr. Robert Reyburn; *Vice-President*, George W. White; *House Committee*, Albert Le Breton, Chr. Joseph L. Shaw and Joseph W. Anderson, M.D.; *Directors*, the officers and Miss Cora Gerish, and Messrs. W C. Babcock and Joseph W. Anderson, M.D.; *Treasurer*, William P. Herbst, 2500 Pennsylvania Avenue, N.W.; *Secretary*, Joseph L. Shaw, 730 Eleventh Street, N.W. Place of meeting, 401 Seventh Street, N.W. Regular meetings, first and third Saturday of each month, except in July and August first Saturday of each month. Membership September 1: Honorary, 5; active, 35; total, 40. Exhibitions, annual, in November.

"CENTRAL CAMERA CLUB" OF THE BROOKLYN Y. M. C. A.—502 Fulton Street, Brooklyn, "Studio." Organized 1888. *President*, William H. Lowery; *Vice-President*, Arthur H. Longstreet; *Treasurer*, J. G. McTaggart; *Secretary*, Percy Lothrop, 16 Coenties Slip, New York City. Place of meeting, "Studio,", 502 Fulton Street, Brooklyn. Ordinary meetings, second and fourth Thursdays of each month at 8 P.M. Annual meeting, second Thursday in January. Membership September 1: Honorary, 18. Publications, Anthony's *Bulletin*, *Pointer*. Exhibitions: Annual in September.

CHAUTAUQUA PHOTOGRAPHIC EXCHANGE CLUB.—North, South, East and West. *President*, C. M. Fitzgerald, Georgetown, Cal.; *Secretary*, Mrs. C. L. Pierce, Riverside, Conn. Membership September 1: 12.

CHICAGO SOCIETY OF AMATEUR PHOTOGRAPHERS.—Handel Hall, 40 E. Randolph Street, Chicago, Ill. Organized September 1, 1886. *President*, W. A. Morse, 20 Kemper Place; *Vice-President*, W. R. Wilson, 1313 Michigan Ave.; *Board of Directors*, President, Vice-President, Secretary, Treasurer, and three Directors, constitute the Board; *Treasurer*, Marshall Waite; *Secretary*, F. F. Gaylord, 597 Clevelond Ave., Chicago, Ill. Place of meeting, Handel Hall, 40 E. Randolph St. Ordinary meetings, second and fourth Thursdays each month, except July and August. Special meetings, first or third Thursdays each month, except July and August. Annual meeting, fourth Thursday in January each year. Membership September 1: Honorary, 4, active, 69, total, 73. Exhibitions: Dates not fixed. We alternate at the ordinary or regular meetings, Print Exhibitions. Social evening, or a special Lantern Exhibition.

*CINCINNATI SOCIETY OF NATURAL HISTORY, PHOTOGRAPHIC SECTION.—Organized 1884. *President*, H. J. Buntin; *Vice-President*, T. H. Kelly; *Treasurer*, F. M. Coppeck; *Librarian*, Dr. A. I. Carsen; *Secretary*, J. M Kay, 108 W. Fourth Street, Cincinnati, Ohio. Place of meeting, 108 Broadway. Ordinary meetings, second and fourth Monday evenings of each month. Annual meeting, first Monday of April. Membership September 1: Honorary, 1; active, 100; total, 101.

CLEVELAND CAMERA CLUB.—(Until spring of 1897) 136 Ontario Street (Room No. 1888). Cleveland *President*, Wm. Ogier; *Vice-President*, Chas. Potter; *Treasurer*, William Dorn; *Custodian*, Frank Dorn; *Secretary*, R. Dayton, 1202 Wellson Avenue, Cleveland. Place of meeting, 136 Ontario Street (Room No. 6). Ordinary meetings, first and third Monday of each month. Special meetings called on request of six members. Annual meeting, third Monday in December. Membership September 1: Honorary, 1; active, 25; total, 26. Exhibitions are held at various times, mutually agreeable to members.

COLORADA CAMERA CLUB ASSOCIATION.—329 16th Street, Denver, Colorado. Organized September, 1890. *President*, W. H. Jackson; *Vice-President*, H. H. Buckwalter; *Directors*, W. H. Jackson, A. D. Gilleland, H. D. Smith, H. H. Buckwalter, J. P. Brockway, C. S. McCurdy, C. D. Kirkland; *Treasurer*, H. D. Smith; *Librarian*, A. D. Gilleland; *Secretary*, A. D. Gilleland, 1832 Clarkson Street, Denver, Colorado. Place of meeting, Club Rooms, 329 16th Street. Ordinary meetings, Directors meet first Thursday each month in Club Rooms, 4 P.M. Special meetings, called by President. Annual meeting, December. Membership September 1; Honorary, 1, associate, 25, stock members. 45, total, 71. Exhibitions: Annual, latter part of November; open to the State this year, both amateur and professional. Slide competition every two months. Slide exhibition about once every month, from October to April. Bicycling division have runs about every other Sunday to prominent places within fifty miles from Denver.

COLUMBIAN AMATEUR PHOTO EXCHANGE.—Have no permanent location, as members are scattered out pretty well, and living great distances apart. Organized March 1, 1893. *President*, A. H. Waite; *Treasurer and Secretary*, W. E. Dickinson, Bradford, Iowa. Membership September 1: 13. Established for interchange of ideas, discussion of photographic processes, and for quarterly exchange of prints, using as a basis of exchange one 8x10 print, each member doing all the work himself. Have printed constitution and by-laws.

*COLUMBIA CAMERA CLUB.—Astoria, Oregon. *President*, Wm, A. Sherman; *Vice-President*, Nelson Froyer; *Directors*, W. A. Sherman, G. W. Lounsberry, Nelson

Froyer, James Macomber, Wm. Timson; *Treasurer*, Wm. W. Lounsberry; *Secretary*, Wm. Timson, 598 Commercial Street, Astoria, Oregon. Place of meeting, Engine Company's Hall. Ordinary meetings, second Wednesday of each month. Special meetings at call of President. Annual meeting, second Wednesday in November. Membership September 1: Honorary, 1; active, 15; associate 10; total, 26.

COLUMBIA PHOTOGRAPHIC SOCIETY.—1507 Columbia Avenue, Philadelphia, Pa. Organized December 7, 1889. Incorporated June 29, 1894. *President*, Dr. G. J. R. Miller; *Vice-President*, W. P. Buchanan; *Board of Directors*, Dr. G. J. R. Miller, W. P. Buchanan, John N. Reeve, H. E. Havens, Rudolf Pott, Benj. L. Berry, Chas. J. Cole; *Secretary and Treasurer*, John N. Reeve, 203 Walnut Place, Room 4, Philadelphia, Pa. Place of meeting, 1507 Columbia Avenue. Ordinary meetings, every Monday evening. Special meetings, first Monday in every month. Annua, meeting, first Monday in February. Membership September 1: Honorary, 3; activel 67; corresponding. 2; total, 72. Buchanan prize, October 12, 1896. Enlargement contest, November 9, 1896. Lantern-slide contest, December 14, 1896.

*COLUMBUS CAMERA CLUB.—Y. M. C. A. Building, Columbus, Ohio. Organized October 6, 1884. Incorporated February, 1891. *President*, John Field; *Vice-President*, C. H. Doty; *Directors*, John Field, C. H. Doty, W. B. Kimball, C. S. Bradley, Hester C. Getz, P. P. Smythe, S. C. Bradford, J. J. Jennings, F. H. Hnwe, *Treasurer*, C S. Bradley; *Librarian*, Hester C. Getz; *Secretary*, W. B. Kimball, No. 32 East Spring Street, Columbus. O. Place of meeting, Columbus Camera Club. Y. M. C. A. Building. Ordinary meetings, third Thursday of each month. Special meetings, subject to the call of the President. Annual meeting, third Thursday in December. Membership September 1: Honorary, 4; active, 60; total, 64. Annual outing, May 30.

CORLISS ART CAMERA CLUB.—Newburyport, Mass. *President*, John H. Wheeler; *Vice-President*, Louis H. Tappan; *Secretary and Treasurer*, Myron R. Currier; *Corresponding Secretary*, Otis P. Gould.

CORTLAND CAMERA CLUB.—Cortland, N. Y. Organized January 23, 1895. *President*, F. W. Higgins; *Vice-President*, J. G. Jarvis; *Treasurer*, L. M. Alexander; *Secretary*, L. M. Alexander, Lock Box 213, Cortland, N. Y. Place of meeting, Young Men's Christian Association. Ordinary meetings, the first Wednesday evening of each month, 8 o'clock. Special meetings at the call of the President. Annual meeting, the meeting in January. Membership September 1: 13. Exhibitions: the club hold an annual exhibition of pictures at the November meeting of each year.

*DELAWARE CAMERA CLUB.—Wilmington, Del. Organized December 5, 1891. *President*, John M. Rogers; *Vice-President*, 1st, Miss Rachel S. Howland; 2d, George A. Elliott; *Executive Committee*, Albert C. Griggs, Ernest B. MacNair, William H. Savery; *Treasurer*, Caleb M. Sheward; *Recording Secretary*, Willard C. Jackson; *Corresponding Secretary*, John C. Philips. 803 Franklin Street, Wilmington, Del. Place of meeting, Club Rooms, Equitable Building. Ordinary meetings, first Thursday in each month at 8 o'clock, P.M. Special meetings, at the call of the President. Annual meeting, first Thursday in January, 8 P.M. Membership September 1: Active, 52; corresponding, 4; total, 56.

*DETROIT LANTERN CLUB.—Detroit, Mich. Organized Jan. 6, 1891. *President*, Frank E. Kirby; *Director*, Alfred Noble, Jr.; *Treasurer and Secretary*, D. Farrand Henry, 52 Woodward Avenue. Place of meeting, Art Museum. Ordinary meetings, second Monday in each month. Annual meeting, January 6. Membership September 1: 22. Exhibitions: lantern exhibition about twice a month through the season.

ELIZABETH CAMERA CLUB.—96 Broad Street, Elizabeth, N. J. Organized 1893. *President*, James A. Knowles· *Vice-President*, A. P. Campbell; *Treasurer*, James A. Knowles; *Librarian*, E. W. Smith; *Se retary*, John Ball, 96 Broad. Place of meeting, 96 Broad Street. Ordinary meetings, first Saturday each month. Annual meeting, first Tuesday in May. Membership September 1: Honorary, 2; active, 21; Corresponding, 3; total, 26. Exhibitions anticipated during fall and winter months.

*FRANKFORD CAMERA CLUB.—Main and Unity Streets, Frankford, Philadelphia. Organized, October, 1889. *President*, J. Howard Morrison; *Vice-President*, Rich B. Watmough; *Executive Committee*, Benj. S. Thorp, Robert T. Taylor, Rembrandt P. Summers, Miss M. C. Shallcross, Mrs. E. B. G. Justice; *Treasurer*, J. Howard Horrocks; *Secretary*, John M. Justice, 5016 Penn Street, Frankford, Philadelphia. Place of meeting, Wright's Institute, Main and Unity Streets. Ordinary meetings, second Friday of each month, 8 P.M. Conversation meetings, fourth Friday of each month, 8 P.M. Annual meeting, second Friday in April. Membership September 1: Honorary, 3; active, 81; corresponding, 3; total, 87. Exhibitions: annual exhibition held early in April each year. Visitors welcome at all meetings, and the club rooms open to strangers who may desire to use them.

HAMILTON ASSOCIATION CAMERA SECTION.—Hamilton, Ontario, Canada. Organized 1888. *President*, J. R. Moodie; *Vice-Presidents*, John H. Land, Alfred H. Baker. *Executive Committee*, Samuel Briggs, A. M. Cunningham, Wm. White; *Treasurer*, Geo. H. Lees; *Secretary*, John M. Eastwood, Hamilton, Canada. Place of meeting, Public Library Building. Ordinary meetings, twice a month on second and fourth Tuesdays, at 8 P.M. Annual meeting, fourth Tuesday in April. Membership September 1: 43. Publications: The annual record published in the proceedings of the Hamilton Association. Exhibitions: Yearly exhibitions of members' work, special demonstrations, and weekly lantern slide entertainments during winter months.

HARVARD CAMERA CLUB.—Harvard University, Cambridge, Mass. Organized 1889. *President*, Vernon Mannse, '96; *Vice-President*, C. P. M. Rumford, '9.; *Executive Committee*, Officers, and W. B. Homes, '96, W. H. Wheelock, '98; *Treasurer*, Percy Emerson Brown, '97; *Secretary*, Percy Emerson Brown, '97, 11 Weld Hall, Cambridge, Mass. Place of meeting, Haward University. Annual meeting September 30th, 1896, 8 P.M. Membership September 1: Honorary, 1; active, 30; total, 31 Exhibitions: Annual exhibition held at Sever Hall, Cambridge, in March.

*HOBOKEN CAMERA CLUB.—Hoboken, N. J. Organized 1889. *President*, A. J. Thomas; *Vice-President*, C. Ludhaus; *Treasurer*, H J. Kaltenback; *Secretary*, A. L. Smith, 1045 Bloomfield Street, Hoboken, N. J. Place of meeting. Camera Building, 1036 Park Avenue. Ordinary meetings, first Tuesday of each month. Annual meeting in March. Membership September 1: 25. Exhibitions every month during the season.

INTERNATIONAL PHOTO PRINT EXCHANGE.—Organized May, 1893. A postal photo exchange club. *Secretary*, Walter Sprange, Beach Bluff, Mass. Membership September 1: 17.

*KEARNEY KAMERA KLUB.—Kearney, Neb. Organized October, 1894. *President*, J. T. Morey; *Vice-President*, Miss H. E. James; *Executive Committee*, R. M. Brockman, A. Snare, Miss L. A. Piper: *Treasurer*, Miss A. E. Knight; *Librarian*, H. E. Knight; *Secretary*, M. A. Hoover, M.D. Place of meeting, Kearney Public School. Ordinary meetings, first and third Saturdays of each month.

LANCASTER CAMERA CLUB.—Lancaster, Pa. Organized May 25, 1895. *President*, Wm. S. Gleim; *Vice-President*, Wm. A. Heilshu; *Treasurer*, F. A. Demuth; *Librarian*, G. Howard Werntz; *Secretary*, F. A. Demuth, 114 E. King Street. Lancaster, Pa. Place of meeting, Moore Building, rooms of G. Howard Werntz. Ordinary meetings first Friday evening of each month, from September to June, 8 o'clock, P.M. Special meetings at call of the President or two-thirds of the members Annual meeting first Friday evening in June. Membership September 1: 16. Exhibitions: Lantern slides on last Wednesday in February.

*LAWRENCE CAMERA CLUB.—Lawrence, Mass. Organized April, 1893. *President*, John Lord; *Vice-Presidents*, John H. Greer and Caleb Saunders; *Directors*, Miss Mabel Noyes, E. Braithwaite, G. C. Cannon; *Treasurer*, Carl H. Graf; *Librarian*, Miss Carrie J. Pingree; *Secretary*, Richard A. Hale, Lawrence, Mass. Place of meeting, Central Block. Ordinary meetings, first Thursday in each month at 8 P.M. Annual meeting, first Thursday in April. Exhibitions usually in November.

LOWELL CAMERA CLUB.—Lowell, Mass. Organized 1889; Incorporated 1892. *President*, Paul Butler; *Vice-President*, Wm. P. Atwood; *Executive Committee*, The officers, and Charles Runels, F. M. Goodhue, Fay H. Martin; *Treasurer*, M. A. Taylor; *Librarian*, A. H. Sanborn; *Secretary*, George A. Nelson, Lowell, Mass. Place of meeting, Central Block. All meetings subject to call of President. Annual meeting first Tuesday in March. Membership September 1: 21.

MATAPAN CAMERA CLUB.—Mattapan, Mass. Organized May, 1890. *President*, John A. Locklin; *Vice-President*, Walter Hertzberg; *Treasurer*, Henry N. Locklin; *Librarian*, Miss Sadie Locklin. *Secretary*, Erdmann Sonnenbrodt, box 83, Mattapan, Mass. Place of meeting, Brush Hill Road, Milton, Mass. Ordinary meetings, every Sunday. Annual meeting, May. Membership September 1: 12. Exhibitions: Lantern exhibitions once a month during winter months.

*MEMPHIS CAMERA CLUB.—38 Madison Street, Memphis, Tenn. Organized April 1, 1893. *President*, Sam J. Latta; *Vice-President*, A. Wardle; *Board of Directors*. S. J. Latta, A. Wardle, George O. Friedel, Matt Stewart, E. I. Pinnel; *Treasurer and Secretary*, Geo. O. Friedel, 165 Gayoso Street, Memphis, Tenn. Place of meeting, 38 Madison Street. Ordinary meetings, first and third Tuesdays in each month. Special meetings can be called by Chairman of Board of Directors. Annual meeting, first Tuesday in April. Membership September 1: Honorary, 3; active, 32; total, 35. Exhibitions: Stereopticon, at irregular intervals. Prints, once a year, but at no stated period.

MINNEAPOLIS CAMERA CLUB.—15 N. Fourth Street, Minneapolis, Minn. Organized 1892. *President*, W. B. Augir; *Vice President*, W. H. McMullen; *Board of Managers*, President, Vice-President, Treasurer and Secretary, and six other directors; *Treasurer*, A. S. Williams; *Secretary*, C. J. Hibbard, 17 S. Fourth Street. Place of meeting, Club rooms. Ordinary meetings, second Wednesday in each month. Special meetings, at call of President. Annual meeting, April. Exhibitions, Lantern exhibitions by members, and interchange slides, at frequent intervals, from September till June.

MONTREAL CAMERA CLUB.—4 Phillips Square, Montreal. Organized 1890. Incorporated 1892. *President*, Edward Stanger; *Vice-President*, Charles Lester; *Executive Committee*, A. J. Ferguson, George Sumner, A. B. Macfarlane, Albert Holden, J. Hamilton Ferns, George McDougall; *Treasurer*, A. Clarence Lyman; *Secretary*, Alfred W. Cole, 28 Victoria Street, Montreal. Place of meeting, Club Rooms. Ordinary meetings, first and third Tuesdays in each month from October to June inclusive. Annual meeting, first Tuesday in May. Membership September 1: 75. Exhibitions regularly held in fall and spring.

MOUNT VERNON, CAMERA CLUB OF.—Mount Vernon, N. Y. Organized March 11, 1895. *President*, B. H. Carmer; *Vice-President*, Edgar Henriques; *Treasurer*, S. W. Nourse; *Librarian*, A. J. Cunningham; *Secretary*, Mary E. Jennings, 512 S. First Avenue, Mount Vernon, N. Y. Place of meeting at members' houses. Ordinary meetings are held once a month. Membership September 1: 20. Exhibitions are held once each year.

MYSTIC CAMERA CLUB.—Medford, Mass. Organized June 4, 1889. Incorporated March 17, 1891. *President*, Charles A. Smith; *Vice-President*, Warren M. Archibald; *Executive Committee*, C. A. Smith, W. M. Archibald, C. A. Staniford, J. B. Thaxter, Jr., C. A. Clark, Will C. Eddy and B. D. B. Bourne; *Treasurer*, Jos. B. Thaxter, Jr.; *Librarian*, W. H. Halliday; *Historian*, Will C. Eddy; *Secretary*, C. A. Staniford, 87 Gilman Street, Somerville. Place of meeting, 202 High Street, Medford. Ordinary meetings, first and third Tuesdays of each month. Special meetings at call of Executive Board. Annual meeting, first Tuesday in January. Membership September 1: Honorary, 6; active, 35; associate, 3; total, 44. Publications, annual catalogue and leaflet. Exhibitions, beginning April 20, continuing two or three days, and every month throughout the year.

MICHIGAN, PHOTOGRAPHERS' ASSOCIATION OF.—Michigan. Organized January 15, 1895. *President*, C. M. Hayes, Detroit; *First Vice-President*, C. E. Heath, Grand Rapids; *Second Vice-President*, E. S. Tray, Jackson; *Executive Committee*, C. M. Hayes, C. E. Heath, E. S. Tray, A. G. McMichael, J. E. Watson; *Treasurer*, A. G. McMichael, Detroit; *Secretary*, J. E. Watson, 148 Woodward Avenue, Detroit, Mich. Place of meeting, Detroit. Ordinary meetings at the Annual Convention in February. Exhibitions at the Annual Meeting in February, 1897. Date not yet decided on.

NEWARK CAMERA CLUB.—224 Market St., Newark, N. J. Organized April 18, 1888. *President*, Paul L. V. Thierey; *Vice-President*, W. A. Halsey; *Executive Committee*, Messrs. Halsey, Olds, Janson, Schuetz, Eberhardt, Thierey, Hayden; *Treasurer*, J. M. Foote; *Secretary*, J. M. Foote. Place of meeting, 224 Broad Street. Ordinary meetings, second and fourth Mondays each month. Annual meeting, second Monday in April. Membership September 1: Honorary, 4, active, 31, associate, 20, total, 55. Exhibitions: One in Fall of Lantern Slide work; weekly, Club Rooms.

NEWARK (DEL.) CAMERA CLUB.—Newark, Delaware. Organized 1892. *President*, F. D. Chester; *Vice-President*, J. P. Armstrong; *Treasurer*, H. L. Bishop; *Secretary*, F. Wm. Curtis, Newark, Delaware. Annual meeting, January 15. Slide exhibitions during winter.

NEW BRITAIN CAMERA CLUB.—210 Main Street, New Britain, Conn. Organized February 23, 1892. *President*, E. F. Porter; *Vice-President*, G. A. Reckard; *Board of Managers*, C. F. Chase, E. M. Hulbert, R. H. Russell, L. S. Risley; *Treasurer-Secretary*, F. B Wood, 273 Main Street, New Britain, Conn. Place of meeting, 210 Main Street. Ordinary meetings, 8 P.M. Tuesday evenings, the second and fourth in each month. Annual meeting, second Tuesday in January. Membership September 1: Honorary, 30; active, 19; total, 49.

*NEW ORLEANS CAMERA CLUB.—712 Union Street, New Orleans, La. Organized December 17, 1886. *President*, Bernard C. Shields; *Vice-President*. William Gowland; *Board of Directors*, Bernard C. Shields, William Gowland. William Grimshaw, M. V. Haulard, Jeff C. Wenck, S. D. Mitchel, J. E. Bowman· O. W Bogel, George Gowland; *Treasurer*, William Grimshaw; *Librarian*, P. S. Benedict, Chairman. Library Committee; *Secretary*, M. V. Haulard, 1729 Bienville Avenue. New Orleans, La. Place of meeting, at Club Rooms, 712 Union Street. Ordinary meetings, on the first Wednesday of each month. Informal meetings are held every Wednesday, Special meetings called by the President at the written request of six members. Annual meeting on first Wednesday in November. Membership September 1: Hon-

orary, 10; active, 70; corresponding, 12; total, 92. Exhibitions: Annual print exhibit given on first Wednesday in May. Lantern-slide exhibitions given once or twice a month, during the fall, winter and spring. The Club is a member of the Lantern-Slide Interchange, Mr. E. M. Haskill, Chairman of the Lantern Committee, being the Director representing this Club in the Interchange. A print competition among the members takes place at the close of each monthly meeting.

NEWTON CAMERA CLUB.—Newton, Mass. Incorporated. *President*, Freeland O. Stanley; *Vice-President*, E. E. Snyder; *Executive Committee*, C. E. Lord, F. H. Bent and other officers *ex officio; Treasurer-Secretary*, Austin S. Kilburn, West Newton, Mass. Place of meeting at members' residences. Ordinary meetings, first Wednesday in each month except June, July and August. Annual meeting, first Wednesday in January. Membership September 1: Active, 10. Exhibitions projected for late fall 1896 or early winter '97.

OLD COLONY CAMERA CLUB.—Rockland, Mass. Organized February 1, 1890. *President*, David Smith; *Vice-President*, Emery H. Jenkins; *Treasurer*, Emery H. Jenkins; *Secretary*, David Smith, Rockland, Mass. Place of meeting, at the residence of members. Special meetings at the call of the President. Annual meeting, first Saturday in January. Membership September 1: 9.

*OMAHA CAMERA CLUB.—1312 Farnam Street, Omaha, Neb. Organized February, 1894. *President*, Dr. C. W. Hayes; *Vice-Presidents*, 1st. A. S. Billings, Jr.; 2d: L. R. Sharp. *Executive Committee*, Dr. C. N. Hayes, L. R. Sharp, E. C. Brownlee, W. F. Durnall; *Treasurer* E. C. Brownlee; *Librarian*, L. R. Sharp; *Secretary*, W. F. Durnall, 1312 Farnam Street, Omaha, Neb. Place of meeting, Club rooms, 1312 Farnam Street. Ordinary meetings, second Monday in each month. Special meetings called by President. Annual meeting, second Monday in February. Membership September 1: Total, 45. Exhibitions: Proposed exhibit in October for this year. Generally held in spring and fall. No regular dates. Free dark-room for visiting members from other clubs.

ONEIDA CAMERA CLUB.—Post Office Block, Oneida, N. Y. Organized March, 1894. *President*, B. S. Teale; *Vice-President*, Geo. R. Hanson; *Executive Committee*, C. H. Parsons, Jacob Staudt, R. A. Hill; *Treasurer*, Albert Dygert; *Secretary*, E. R. McDougall, 55 Main Street, Oneida, N. Y. Ordinary meetings, monthly—second Thursday. Annual meeting, March. Membership September 1: 28. Exhibitions: Lantern Slide. Slides made by members of Club, only date not fixed.

ORANGE CAMERA CLUB.—222 Main Street, Orange, N. J. Organized March 21, 1892. Incorporated May 19, 1893. *President*, Wm. F. D. Crane; *Vice-President*, Wm. T. Baird; *Executive Committee*, Wm. F. D. Crane, President; Wm. T. Baird, Vice-President; David S. Plumb, Treasurer; W Hermann Apgar, Secretary; Herman Joerns, Chairman Finance Committee; George E. Melendy, Chairman House Committee; John L. Yatman, Chairman Membership Committee; Wm. H. Cheney, Chairman Lantern Slide Committee; Frank E. Gerbert, Chairman Library Committee; *Treasurer*, David S. Plumb; *Librarian*, Frank E. Gerbert; *Chairman Outing Committee*, W. H. Apgar; *Chairman Entertainment Committee*, H. A. Harvey; *Secretary*, W. Hermann Apgar, 125 Beach Street, East Orange, N. J. Place of meeting, 222 Main Street, Orange. Ordinary meetings, 5th and 20th of each month, except July and August. Special meetings at call of President or on request of five members. Annual meeting, March 20. Membership September 1: Honorary, 55; active, 2; total, 57. Exhibitions, Club competition about November 1. Public exhibition about November 1, besides the open meetings for ladies, smokers, etc., at all of which the purposes of the club are not forgotten.

OREGON CAMERA CLUB.—Oregonian Building, Portland, Oregon. Organized January, 1895. *President*, Edgar Felloes; *Vice-President*, J. C. Perry; *Executive Committee*, Edgar Felloes, J. C. Percy, Milton P. Goldsmith, F. A. Jackson, Hugo B. Goldsmith; *Treasurer*, F. A. Jackson; *Secretary*, Milton P. Goldsmith, P. O. Box 93, Portland, Oregon. Place of meeting, Club Rooms, Oregonian Building. Ordinary meetings, second Tuesday of each month at 8 P. M. Special meetings every Friday evening at 8 P. M. Annual meeting second Tuesday in January. Exhibitions: Annual Print Exhibitions, October 3 to 10 inclusive.

*PATERSON CAMERA CLUB.—Paterson, N. J. Organized 1893. *President*, C. M. Gilds; *Vice-President*, H. W. Gledhill, *Treasurer*, W. M. Moore; *Librarian*, F. B. Hoagland; *Secretary*, C. D. Cooke, Paterson, N. J. Place of meeting, 9 Lake Street. Ordinary meeting, first Monday in the month. Annual meeting in May. Membership September 1: 33. The Club is open from 8 A.M. to 10 P.M.

PHILADELPHIA, THE PHOTOGRAPHIC SOCIETY OF.—Philadelphia, Penna, Organized November, 1863. *President*, Joseph H. Burroughs; *Vice-Presidents*, Charles R. Pancoast and Robert S. Redfield; *Board of Directors*, John C. Browne, John G. Bullock, S. Castner, Jr., J. Hunter Ewing, F. Wm. Geisse, Alex. Hemsley,

Wm. N. Jennings, A. B. Parvin, Wm. H. Rau, A. W. Robinson, Samuel Gartain, Benj. Sharp, M.D., and the officers; *Treasurer*, George Vaux, Jr.; *Secretary*, Edmund Stirling, 4517 Kingsessing Ave., B. Place of meeting, 10 South 18th Street. Ordinary meetings, second Wednesdays, 8 P.M., except in July, August and September. Special meetings, first and fourth Wednesdays, 8 P.M. Annual meeting, second Wednesday in April. Membership September 1: Honorary, 2, active, 210, total, 212. Publications: Journal of the Photographic Society of Philadelphia. Exhibitions: An annual exhibition of members' work, and special wall displays, monthly.

PITTSBURG AMATEUR PHOTOGRAPHERS' SOCIETY.—Pittsburg, Pa. Organized 1886. Incorporated 1896. *President*, C. C. Craft, Crafton, Penna; *Vice-President*, E. E. Keller; *Board of Trustees*, C. C. Craft, E. E. Keller, L. S. Clarke, H. L. Christy, A. R. Neeb, W. S. Clow, Wm. J. Boston, W. J. Hunker, Jos. H. Hunter; *Treasurer*, W. J. Hunker; *Librarian*, H. E. Watt, Dravosburg, Pa.; *Secretary*, Jos. H. Hunter, 520 Green Street, Pittsburg, Pa. Place of meeting, Carnegie Library, Pittsburg, Pa. Ordinary meetings, second Monday of each month, with the exception of January, June, July, August and September. Special meetings, when called by the President or Board of Trustees. Annual meeting second Monday in January. Membership September 1: Honorary, 1; active, 81; total, 85. Exhibitions of Lantern Slides once a month.

PITTSFIELD CAMERA CLUB.—Pittsfield, Mass. Organized February 1, 1892. *President*, Clarence G. Tompkins; *Vice-President*, R. B. Johnston; *Executive Committee*, C. G. Tompkins. R. B. Johnston, J. E. Colton, J. D. Roscoe, J. F. Middleton, and W. D. Goodwin; *Treasurer*, Joseph E. Colton; *Secretary*, Joseph E. Colton, 768 North Street, Pittsfield, Mass. Place of meeting, homes of members. Ordinary meetings first Wednesday of each month at 8 P.M. Special meetings when called by the President through the Secretary. Annual meeting first Monday in February. Membership, Honorary, 1; active, 28; total, 29. Exhibitions middle of February, usually each year.

PLAINFIELD CAMERA CLUB.—Plainfield, N. J. Organized September, 1886. *President*, Otto Arens; *Vice-President*, Harrold Sewell; *Executive Committee*, Officers and William Rogers and Walter Freeman; *Treasurer*, H. H. Coward; *Librarian*, F. R. Stevens; *Secretary*, J. H. Doane, Park Avenue, Plainfield, N. J. Place of meeting, Club Rooms, Babcock Building. Ordinary meetings, second and fourth Mondays of each month. Annual meeting, fourth Monday in December. Membership September 1: Honorary, 7; active, 49; total, 56.

*PORTLAND CAMERA CLUB.—Portland, Maine; Rooms of Portland Society of Art; Deering place. Organized February, 1890. *President*, Stanley P. Warren, M.D., *Vice-President*, Nathan Clifford; *Executive Committee*, F. M. Lawrence, Harry Levy, Wm. Sweat, F. H. Little; *Treasurer*, Clayton T. Whipple; *Secretary*, Frederick Fox, Jr., 66 Union Street, Portland, Me. Place of meeting, Society Art Rooms. Ordinary meetings, first Tuesday of each month. Special meetings whenever called. Annual meeting, first Tuesday in February. Membership, September 1: Honorary, 5; active, 46; total, 51. Exhibitions: no regular exhibition given other than slide exhibitions of the American Lantern Slide Exchange about every two weeks.

POSTAL PHOTOGRAPHIC CLUB.—Organized December 1888. *President*, Wilfred A. French, Boston, Mass.; *Secretary and Treasurer*, F. E. Fairbanks, 11 Day Street, Fitchburg, Mass. Membership September 1: 39. Publications, one album each month, made up from contributions of two or more prints from each member.

PROVIDENCE CAMERA CLUB.—87 Weybosset Street. Providence, R. I. Organized 1883. Incorporated 1890. *President*, R. Clinton Fuller; *Vice-President*, W. Penn Mather; *Executive Committee*, R. C. Fuller, F. P. Wilbur, J. E. Davison, E. A. Darling, C. A. Stoddard, W. A. Dean, J. A. Miller, Jr., F. C. Hodgman, S. B. Burnham; *Treasurer*, Edmund A. Darling; *Recording Secretary*, Fred P. Wilbur; *Corresponding Secretary*, J. Eliot Davison, 112 Cross Street, Central Falls, R. I. Place of meeting, Club Room, 87 Weybosset Street. Ordinary meetings, first Tuesday in each month, 8 P. M. Annual meeting, first Tuesday in June, 8 P. M. Membership September 1: 57.

RUTLAND CAMERA CLUB.—Rutland, Vt. Organized 1893. *President*, Cornele G. Ross; *Executive Committee*, Cornele G. Ross, W. F. Worcester, Louis E. Campbell, U. S. Marshall; *Librarian*, Louis E. Campbell; *Secretary-Treasurer*, W. F. Worcester, 40 Pine Street, Rutland, Vt. Ordinary meetings, second and fourth Tuesdays of each month, except during July and August. Annual meeting, second Tuesday in October. Membership September 1: 17. Exhibitions: Print exhibition in November, Lantern in the spring.

SACRAMENTO CAMERA CLUB.—Organized June 4, 1895. *President*, Dr. J. G. Shaw; *Vice-President*, R. P. Burr; *Board of Directors*, Dr. J. G. Shaw, Geo. Littlefield, Capt. T. B. Hall. R. P. Burr, W. G. Woods, L. W. Nickell, L. M. Fetherolf; *Treasurer*, Geo. Littlefield; *Secretary*, W. G. Woods, 1017 J. Street, Sacramento, Cal. Place of meeting, Club Rooms, 1017 J Street. Ordinary meetings, Thursday nights. Special meetings on call. Annual meeting, June 4. Membership September 1: Honorary, 3, active, 30, associate, 26, total, 59. Exhibitions: Lantern Exhi-



THREE-COLOR PRINT, TAKEN DIRECT FROM THE HAT.

bition every six weeks, supported by subscription for season. Spring Exhibition, Spring and Fall.

SAINT JOHN CAMERA CLUB.—Saint John, New Brunswick, Canada. Organized 1893. *President*, George A. Henderson; *Vice-President*, D. Leavit Hutchinson; *Executive Committee*, F. Tufts, L. A. Griffiths, R. Dole, Count de Bury; *Treasurer*, J. R. Woodburn; *Secretary*, J. Kaye-Allison, P. O. Box 401, St. John, New Brunswick. Place of meeting, 65 Prince William Street. Ordinary meetings, second and fourth Mondays at 8 P. M. Special meetings, first and third Mondays at 8 P. M. Annual meeting third Monday in April. Membership September 1: Honorary, 3; active, 68; corresponding, 4; total, 75. Exhibitions: Annual exchange of lantern slides with clubs in Montreal, Toronto and Hamilton, members of "Canadian Lantern Slide Interchange." Visitors are always welcome at rooms.

*SAN DIEGO CAMERA CLUB.—San Diego, Cal. Organized 1893. *President*, J. Rodes, M.D.; *Vice-President*, C. Welborn; *Treasurer*, Miss L. B. Anderson; *Secretary*, W. W. Whitson, 1934 4th Street, San Diego, Cal. Place of meeting, D Street, between 4th and 5th Streets. Ordinary meetings, first Tuesday. Annual meeting in January. Membership September 1: Total, 84.

SCHUYLKILL CAMERA CLUB.—Pottsville, Pa. Organized July 5, 1889. *President*, A. W. Shrafer; *Vice-President*, Miss Elena Roads; *Executive Committee*, the officers; *Treasurer*, W. L. Shrafer; *Librarian*, the Secretary; *Secretary*, B. S. Simonds, 400 Mahantongo Street, Pottsville, Pa. Place of meeting, Shrafer Office Building. Ordinary meetings, first Friday of month. Annual meeting, May. Membership September 1: Honorary, 4; active, 48; corresponding, 39; total, 91. Exhibitions at annual meetings in May. Exhibitions of American Lantern Slides every two weeks.

SEATTLE CAMERA CLUB.—Seattle, Wash. Organized January 28, 1895. *President*, Mrs. C. L. Denny; *Vice-President*, Dr. F. A. Churchill; *Executive Committee*, Mrs. C. L. Denny, Eugene Ricksecker, Orrin O. Denny, A. F. Tourville, and C. W. Parker; *Treasurer*, C. W. Parker; *Secretary*, Eugene Ricksecker, P. O. Box 289, Seattle, Wash. Place of meeting, 621-624 Pioneer Building. Ordinary meetings, third Monday of each month, 8 P.M. Special meetings on call of the President. Annual meeting, third Monday in January. Membership September 1: Honorary, 1; active, 51; corresponding, 1; total, 53. Exhibitions: first annual was held January 15, 16 and 17, 1896, and on account of large number of visitors was kept open until the 25th. Second Annual will be held in January, 1897, prior to the annual meeting.

*SPRINGFIELD CAMERA CLUB.—Springfield, Mass. Organized October, 1880. *President*, Henry C. Haile; *Executive Committee*, Henry C. Haile, Wm. M. Lester, Chas. C. McElwain, Wm. B. Sleigh, Wm. P. Draper; *Treasurer*, Wm. M. Lester; *Librarian*, Wm B. Sleigh; *Secretary*, Chas. C. McElwain, 43 Federal Street, Springfield, Mass. Place of meeting, Rooms, corner State and Dwight Streets. Ordinary meetings, third Wednesday in each month at 7.30 P.M. Special meetings at call of Executive Committee. Annual meeting, third Wednesday in October, at 7.30 P M. Membership September 1: Honorary, 5; active, 50; total, 55.

ST. LOUIS PHOTOGRAPHIC SOCIETY.—Y. M. C. A. Building, Grand and Franklin Avenues, St. Louis, Mo. Organized December 3, 1895. *President*, Robert E. M. Bain; *Vice-President*, John Withnell Dunn, also Chairman of Lantern-Slide Committee; *Executive Committee, Board of Managers, Directors, Council*, Robert E. M. Bain, *Chairman*, John W. Dunn, W. A. Haren, R. E. Collins and J. D. Elliott; *Treasurer*, John D. Elliott; *Librarian*, W. B. Papin; *Chairman of House Committee*, R. E. Collins; *Chairman of Membership Committee*, W. A. Haren; *Secretary*, John D. Elliott, 414 N. Fourth Street, St. Louis. Place of meeting, Club House. Ordinary meetings, first and third Tuesday of each month. Special meetings, lantern exhibitions for the benefit of the society every month. Annual meeting, first Tuesday in December. Membership September 1: 32. Exhibitions: special for members the second meeting of each month; illustrated lectures each meeting During the winter.

The small membership is owing to the society not receiving members this season until the new quarters are fitted up for the reception of the society—probably October 1st. A number of applications now on hand for action.

*ST. PAUL CAMERA CLUB.—St. Paul, Minn. Organized March 6, 1896. *President*, James Paris; *Vice-President*, O. F. Brown; *Directors*, Officers, and W. A. Russell, E. F. Zimmerman, D. H. Buckley, Lorn Campbell, J. C. Jensen, A. M. P. Cowley; *Treasurer*, W. B. Thorne; *Secretary*, W. J. Sonnen, care of St. Paul Fire and Marine Ins. Co., St. Paul, Minn. Place of meeting, Third and Jackson Streets. Ordinary meetings, no regular meetings during summer months. Special meetings at call of five members. Annual meeting, March. Membership September 1: Honorary, 1; active, 38; total, 39.

SYRACUSE CAMERA CLUB.—322 S. Salina Street, Syracuse, N. Y. Organized October, 1886. Incorporated January 19, 1892. *President*, Herbert F. Smith, 1316 Spring Street, Syracuse, N. Y.; *Vice-President*, Geo. E. Timmins, 1410 E. Genesee Street, Syracuse, N. Y.; *Directors*, Present, Vice-President, Secretary and Dr. A. C. Mercer, S. W. Rose, F. J. Schnauber and F. L. Barnes; *Treasurer*, Leray Eldredge, No. 15 Wieting Block; *Librarian*, F. W. Field; *Lantern Slide Inter-*

change Director, W. H. Olmsted; *Secretary*, Fred. W. Field, care of Solvay Process Company, Syracuse, N. Y. Place of meeting, 5 Butler Block, 322 S. Salina Street. Ordinary meetings, every Friday evening at 8 P.M., except during June, July and August. Special meetings, whenever necessary special meetings are called by the Board of Directors or the President. Annual meeting, the first Friday after the first Monday in January each year. Membership September 1: Honorary, 2; active, 91; associate, 27; total, 120. Exhibitions: a lecture course is given each year, and an annual lantern-slide exhibition of work done by the club at the Opera House.

Associate nights are once a month, at which the associate members are privileged to attend, and their friends, to view slides. We are a member of the Interchange, and receive many sets also from other sources. This year we held a print exhibition.

* "TECH" CAMERA CLUB.—Worcester (Mass.) Polytechnic Institute. Organized September, 1889. *President*, Henry J. Fuller; *Vice-President*, A. L. Smith; *Executive Committee*, all Officers: *Treasurer*, John W. Higgins; *Keeper*, C. M. Whitney; *Secretary*, John W. Higgins, 228 West Street, Worcester, Mass. Place of meeting, Boynton Hall, Worcester Polytechnic Institute. Ordinary meetings at call of President and Secretary. Annual meeting, second week in September. Membership September 1; Honorary, 6. active. 7; total, 13. Exhibitions: fall annual.

*TECHNOLOGY PHOTOGRAPHIC SOCIETY.—Massachusetts Institute of Technology, Boston, Mass. Organized 1887. *President*, H. A. Poppenhusen, '96; *Vice-President*, W. M. Partridge, '96; *Executive Committee*, President, Vice-President, Secretary, Treasurer and F. Kleinschmidt, '95; *Treasurer*, A. C. Lawley, '97; *Secretary*, E. J. Loring. Place of meeting, 26 Rogers Building, 491 Boylston Street. Ordinary meetings, second Tuesday in each month, 1 P.M. Special meetings whenever called. Annual meeting in September. Membership May 15 Honorary, 10, active, 20; total, 30. Exhibition "Junior Week" (usually Easter week).

TOPEKA CAMERA CLUB.—Crawford Building. Topeka, Kansas.—Organized September 5, 1894. *President*, W. C. F. Reichenbach; *Vice-President*, F. G. Willard; *Board of Directors*, W. C. F. Reichenbach, F. G. Willard, W. E. Culver, F. M. Tuckerman, Wm. E. Swift, Mrs. Wm. E. Swift, C. C. Baker. *Treasurer*, W. E. Culver; *Secretary and Lantern Slide Director*, F. M. Tuckerman, 34 Santa Fe Building. Place of meeting, Club Rooms. Ordinary meetings, 8 P.M., first and third Tuesdays of each month. Special meetings at call of the President. Annual meeting, first Tuesday in January. Membership September 1: Honorary, 4; active, 44; total, 48. Exhibitions, annual print exhibit; lantern-slide exhibits during winter.

TORONTO CAMERA CLUB.—Cor. Gerrard and Yonge Streets, Toronto, Canada. Organized 1885. Incorporated 1893. *President*, Edmund E. King, M.D.; 1*st Vice-President*, Arthur W. Croil; 2d *Vice-President*, Wm. B. Varley; *Executive Committee*, Hugh Neilson, J. G. Ramsey, G. R. Baker, W. H. Moss, F. D. Manehel, Jno. J. Woolnough; *Treasurer*, Ernest M. Lake; *Secretary*, Ernest M. Lake, 14 King Street, West, Toronto, Ont. Place of meeting, "Forum Building," cor. Gerrard and Yonge Streets. Ordinary meetings, each Monday evening from October 1st to April 30th. Special meetings at call of Secretary. Annual meeting, first Monday in November. Membership September 1: Honorary, 4, active, 142, non-resident, 6, total, 152. Exhibitions: Annually in February or March, open to all. Gold and Silver Medals. Member of American Lantern Slide Interchange, and also of Canadian Lantern Slide Interchange.

*UNIVERSITY CAMERA CLUB.—Lincoln, Neb. Organized January 9, 1892. *President*, Miss Helen Gregory; *Vice-President*, Dr. R. A. Clark; *Executive Committee*, Officers ex-officio; *Secretary and Treasurer*, Miss Adaline Quaintance, P. O. Box, 675 Lincoln, Neb. Place of meeting, Room 4, Chemical Laboratory, State University, Lincoln, Neb. Ordinary meetings, first Tuesday of each month during School year. Annual meeting in May. Membership September 1: Honorary, 5, active, 25, corresponding, 3; total, 33. Exhibitions: annual, held in June, the day before commencement.

*WATERBURY PHOTOGRAPHIC SOCIETY OF. Waterbury, Conn. Organized May, 1888. *President*, H. T. Steadman; *Vice-President*, L. S. White; *Executive Committee*, Frank Welton, Fred, Root; H. G. Filly, Mrs. H. T. Steadman, Miss Alice Depew; *Treasurer*, W. H. Hodges; *Secretary*, G. H. Word, 14 Division Street, Waterbury, Conn. Place of meeting, Brown's Block, South Main Street. Ordinary meetings, first and third Tuesdays of each month. Membership September 1: Active, 66. Exhibitions, every two weeks.

*WORCESTER CAMERA CLUB.—Worcester, Mass. Organized 1892. *President*, E. C. A. Becker; *Treasurer*, A. A. Barker, *Secretary*, D. F, Gav, 214 Main Street, Worcester, Mass. Place of meeting, Walker Building, 405 Main Street. Membership September 1: 65.

*YOUNG LADIES' CAMERA CLUB.—Minneapolis, Minn. Organized November, 1894. *President*, Miss Mabel Jameson, *Vice-President*, Miss M. Belle Jeffery; *Treasurer*, Minerva Turnbull; *Secretary*, M. Eva McIntyre, 1833 Portland Avenue, Minneapolis, Minn. Place of meeting, 808 Nicollet Avenue. at the rooms of the Young Woman's Christian Association. Ordinary meetings, the first Wednesday of each month. Special meetings, and outing each month in summer. Membership September 1, 23.

FOREIGN PHOTOGRAPHIC SOCIETIES.

GREAT BRITAIN AND IRELAND.

ABERDEENSHIRE AMATEUR PHOTOGRAPHIC SOCIETY.—Hon. Secretary, Lewis C. Jamieson, 40 Brighton Place, Aberdeen.

ACCRINGTON AND DISTRICT CAMERA CLUB.—Hon. Secretary, Isaac Hanson, Rothwell Heights, Accrington.

AINTREE PHOTOGRAPHIC SOCIETY.—Secretary, D. J. Neill, 8 Chelsea Road, Aintree, N. B.

AMATEUR PHOTOGRAPHIC FIELD CLUB.—Secretary, B. Gay Wilkinson, 151 Bermondsey Street, London, S. E.

ARCHITECTURAL ASSOCIATION CAMERA CLUB.—Secretary, C. H. Freeman, 9 Frederick Street, Gray's Inn Road, London, W. C.

ARBROATH AMATEUR PHOTOGRAPHIC ASSOCIATION.—Hon. Secretary, J. Hood, 94 High Street, Arbroath.

ASHTON-UNDER-LYNE PHOTOGRAPHIC SOCIETY.—Hon. Secretary, Robt. T. Marsland, 24 Park Parade, Ashton-under-Lyne.

ASTON NATURAL HISTORY AND PHOTOGRAPHIC SOCIETY (PHOTO SECTION).—Hon. Secretary, F. W. Pilditch, 185 Bevington Road, Aston Park.

AYLESBURY AMATEUR PHOTOGRAPHIC SOCIETY.—Hon. Secretary, J. F. Roche, 2 St. Mary's Square, Aylesbury.

BANBURY AND DISTRICT PHOTOGRAPHIC SOCIETY.—Hon. Secretary, J. Davenport, Brookfield, Banbury.

BARNSLEY AND DISTRICT PHOTOGRAPHIC SOCIETY.—Hon. Secretary, C. R. Barham, 9 Corporation Street, Banbury.

BARROW-IN-FURNESS NATURALISTS' FIELD CLUB (PHOTOGRAPHIC SECTION).—Secretary, John Carters, 27 Shakespeare Street, Barrow-in-Furness.

BATLEY AND DISTRICT PHOTOGRAPHIC SOCIETY.—Secretary, T. H. Fox, Grosvenor House, Batley.

BATH PHOTOGRAPHIC SOCIETY.—Secretary and Treasurer, W. Middleton Ashman, 12A Old Bond Street, Bath.

BELFAST WINDSOR AMATEUR PHOTOGRAPHIC RESEARCH CAMERA CLUB.—Secretary, W. J. Gibson, Montpelier House, Belfast.

BEVERLEY PHOTOGRAPHIC SOCIETY.—Secretary, T. J. Morley, Toll Gavel, Beverley, East York.

BIRMINGHAM PHOTOGRAPHIC SOCIETY.—Secretary, C. J. Fowler, Court Mount, Erdington, near Birmingham.

BIRMINGHAM MIDLAND CAMERA CLUB.—Secretary, H. Cooper, 47 Hagley Road, Edgbaston, Birmingham.

BIRMINGHAM NATURAL HISTORY SOCIETY (PHOTOGRAPHIC SECTION).—Secretary, W. P. Marshall, Richmond Hill, Edgbaston.

BLAIRGOWRIE AND DISTRICT PHOTOGRAPHIC ASSOCIATION.—Hon. Secretary, Thos. G. Gorrie, Beachbank, Rathay, Scotland.

BOLTON PHOTOGRAPHIC SOCIETY.—Secretary, J. H. Heyes, Deansgate, Bolton.

BOOTLE PHOTOGRAPHIC SOCIETY.—Hon. Secretary, F. W. Knowles, 311 Stanley Road, Bootle.

BORDER AMATEUR PHOTOGRAPHIC ASSOCIATION.—Hon. Treasurer and Secretary, B. Cartright, 50 High Street, Galashiels, N. B.

BOSTON CAMERA CLUB.—Hon. Secretary, A. H. Smith, Lindum, Boston, Lancs.

BOURNEMOUTH SCIENTIFIC AND ANTIQUARIAN SOCIETY (PHOTOGRAPHIC SECTION).—Hon. Secretary, E. Greenleaves, Priory Mansions, Bath Road, Bournemouth.

"BOYS' OWN" POSTAL PHOTOGRAPHIC CLUB.—Hon. Secretary, J. E. Hardwich, 7 Bedford Terrace, Sunderland.

Bradford Photographic Society.—Hon. Secretary, J. Snowden, 5 Godwen Street, Bradford.

Brechin Photographic Association.—Hon. Secretary, Alexander Watson, Brechin, N.B.

Brighouse Photographic Society.—Hon. Secretary, J. H. Georgeson, Huddersfield Road, Brighouse.

Brighton Photographic Society.—Hon. Secretary. E. Burnham, 52 Gardner Street, Brighton.

Brighton and Sussex Natural History and Philosophical Society (Photographic Section).—Hon. Secretary, R. Chappell Ryan, 43 Campion Avenue, Brighton.

Bristol and West of England Amateur Photographic Association.—Hon. Secretary, E. Brightman Lyndale, Redland Road, Bristol.

British Association for the Advance of Science.—Burlington House; London, W. Secretary, G. Griffiths, M.A., College Road, Harrow.

Brixton and Clapham Camera Club.—Hon. Secretary, F. W. Leavatt, 11 Corrance Road, Acre Lane, S. W.

Bury Photographic and Arts Club.—Secretary, Roger Wood, 10 Bolton Street, Bury, Lancashire.

Camera & Co.—Hon. Treasurer and Secretary, Albert Forrest, 14 Market Street, Pontypridd.

Camera Club.—Secretary, G. C. S. Knight Bruce, Camera Club, Charing Cross Road, London.

Cardiff Photographic Society.—Hon. Secretary, T. H. Faulks, 127 Bute Road, Cardiff.

Carlisle Amateur Photographic Society.—Secretary, John S. Atkinson, 9 Castle Street, Carlisle.

Cheltenham Amateur Photographic Society.—Hon. Treasurer aud Secretary, Philip Thomas, The College Pharmacy, Cheltenham.

Chester Society of Natural Science and Literature (Photographic Section).—Hon. Secretary and Treasurer, J. H. Spencer, 36 Bridge Street, Chester.

Chichester Photographic Society.—Hon. Secretary, E. A. Long, 15 East Street; Chichester.

Chorley Photographic and Sketching Club.—Hon. Secretary, Thomas Brindle, 62 Market Street, Chorley.

City and Guilds of London Technical College (Finsbury) Photographic Society.—Hon Secretary, E. F. Weismuller, Finsbury Technical College, Leonard Street, City Road, London, E.C.

Cleckheaton Mechanics' Institute Photographic Society.—Secretary, William Drake, Cleckheaton.

Clydesdale Camera Club.—Hon. Treasurer and Secretary, Miss Burns, Castle Wemyss, Wemyss Bay, N.B.

Colne Camera Club.—Hon. Secretary, W. W. Kirk, 16 Atkinson Street, Colne, Lancas.

Cornish Camera Club.—Hon. Secretary, H. Tonkin, 22 Market Place, Penzance.

Coventry and Midland Photographic Society.—Hon. Secretary, H. Mountfort, Hampton House, Coventry.

Crewe Amateur Photographic Society. Hon. Secretary, Mr. T. Gorrell, 106 Edleston Road.

Cromwell Photographic Club, Great Yarmouth.—Hon. Secretary, Charles Rumbold, Jr., 4 Dene Side, Great Yarmouth.

Croydon Camera Club.—Secretary, H. E. Holland, 69 Lansdowne Road, Croydon.

Croydon Microscopical and Natural History Club (Photographic Section).—Hon. Secretary, H. Douglas-Gower, 55 Beneon Road, Wadden.

Cyclists' Photographic Portfolio Club.—Hon. Secretary, W. L. J. Orton, 7 Bishop Street, Coventry.

Darlington Photographic Society.—Hon. Secretary, J. Calvert, 64 North Road Darlington.

Darwen Photographic Association.—Hon. Secretary, J. A. Hargreaves, High Bank, Darwen.

Derby Photographic Society.—Hon. Secretary, A. H. Bennett, 137 Normanton, Derby.

DEVONPORT CAMERA CLUB.—Hon. Secretary, E. J. Seymour, 18 St. Aubyn Street, Devonport.

DONCASTER MICROSCOPICAL AND GENERAL SCIENTIFIC SOCIETY.—Hon. Treasurer and Secretary, M. H. Siles, 2 French Gate, Doncaster.

DUKINFIELD PHOTOGRAPHIC SOCIETY.—Hon. Secretary, W. H. Shirley, Commercial Building, Dukinfield.

DUBLIN YOUNG MEN'S CHRISTIAN ASSOCIATION CAMERA CLUB.—Joint Hon. Secretary, E. C. Matsen, 34 Capel Street. Dublin.

DULWICH PHOTOGRAPHIC SOCIETY.—Secretary, Herbert John Ellis, 46 Ondine Road, East Dulwich, S. E.

DUNDEE AND EAST OF SCOTLAND PHOTOGRAPHIC ASSOCIATION.—Hon. Secretary and Treasurer, V. C. Baird. Broughty Ferry, N. B.

DUNSTABLE PHOTOGRAPHIC SOCIETY.—Hon. Secretary, E. Hare, The Poplars, Dunstable.

DURHAM CITY CAMERA CLUB.—Hon. Secretary, Robert Hauxwell, The Avenue, Durham.

EALING PHOTOGRAPHIC SOCIETY.—Hon. Secretary, R. T. Murphy, Argyle Road, Ealing, W.

EASTBOURNE PHOTOGRAPHIC SOCIETY.—Hon. Secretary, J. J. Halloway, 11 Hyde Gardens, Eastbourne.

ECCLES PHOTOGRAPHIC SOCIETY.—Secretary, Harold Hepworth, 3 Hall's Buildings, Eccles.

EDINBURGH PHOTOGRAPHIC CLUB.—Hon. Secretary, T. Barclay, 180 Dalkeith Road, Edinburgh.

EDINBURGH PHOTOGRAPHIC SOCIETY.—Hon. Secretary, J. S. McCulloch, 2 George Street, Edinburgh.

EDINBURGH UNIVERSITY PHOTOGRAPHIC SOCIETY.—Hon. Treasurer and Secretary, H. Overton Hobson, The University Union, Edinburgh.

EXETER CAMERA CLUB.—Hon. Secretary, W. L. Jones, 5 Clifton Hill, Exeter.

FAKENHAM DISTRICT CAMERA CLUB.—Hon. Treasurer and Secretary, Henry Newson, The Square, Fakenham, Norfolk.

FALKIRK AMATEUR PHOTOGRAPHIC ASSOCIATION.—Secretary, John Higgins, High Street, Falkirk, Scotland.

FALMOUTH PHOTOGRAPHIC SOCIETY.—Hon. Secretary, J. M. McGill, 9 Albany Road, Falmouth.

FAVERSHAM INSTITUTE PHOTOGRAPHIC SOCIETY.—Treasurer-Secretary, Charles H. Semark, Stone Street, Faversham.

FINSBURY TECHNICAL COLLEGE PHOTOGRAPHIC SOCIETY.—Secretary, F. R. H. Wood, Finsbury Technical College, Leonard Street, London, E. C.

GAINSBOROUGH AND DISTRICT CAMERA CLUB.—Hon. Secretary, R. C. Puckering, Lee Road, Gainsborough.

GLASGOW AND WEST OF SCOTLAND AMATEUR PHOTOGRAPHIC ASSOCIATION, GLASGOW, SCOTLAND.—Secretaries, William Goodwin, 3 Lynedoch Street, Glasgow; J. C. Oliver, 2 Royal Terrace, Glasgow.

GLASGOW PHOTOGRAPHIC ASSOCIATION.—Hon. Secretary, Fred. Mackenzie, 122 Wellington Street, Glasgow.

GLENALMOND PHOTOGRAPHIC CLUB.—Secretary, G. L. Lamotte, Trinity College, Glenalmond, Perthshire, Scotland.

GLOSSOP DALE PHOTOGRAPHIC SOCIETY.—Hon. Secretary, T. W. Sharpe, Glossop.

GOLDSMITH'S INSTITUTE CAMERA CLUB.—Secretary, H. W. J. Browse, Goldsmith's Institute, New Cross.

GOOLE PHOTOGRAPHIC SOCIETY.—Hon. Secretary, Samuel Wells, Jefferson Street, Goole.

GOSPEL OAK PHOTOGRAPHIC SOCIETY.—Hon. Secretary. W. A. Palmer, 13 Dale Road Kentish Town, N.W.

GRAPHIC SOCIETY.—Hon. Secretary, J. S. Hawker, Mutley House, Plymouth.

GRAVESEND PHOTOGRAPHIC SOCIETY.—Hon. Secretary, T. L. Winnett, 5 The Grove, Gravesend.

GREAT YARMOUTH AMATEUR PHOTOGRAPHIC ASSOCIATION.—Hon. Secretary, G. T. Davis, 4 Market Place, Great Yarmouth.

GREAT YARMOUTH CAMERA CLUB.—Hon. Secretary, H. Harvey George, The Tower, Gorleston, Great Yarmouth.

GRIMSBY AND DISTRICT PHOTOGRAPHIC SOCIETY.—Hon. Secretaries, John H. Clayton, 43 Tarbury Street, Grimsby, and H. Manus, 148 Freeman Street.

GUILDFORD PHOTOGRAPHIC SOCIETY.—Secretary, A. E. Moon, 36 High Street, Guildford.

HACKNEY PHOTOGRAPHIC SOCIETY.—Secretary, Wm. Fenton Jones, F.S.Sc., 12 King Edward Road, Hackney, London, N.E.

HALIFAX CAMERA CLUB.—Hon. Secretary, Arthur Priestly, 7 Commercial Street, Halifax.

HALTWHISTLE AND DISTRICT PHOTOGRAPHIC SOCIETY.—Hon. Treasurer and Secretary, David Macadam, Carlisle City and District Bank, Haltwhistle.

HAMILTON PHOTOGRAPHIC ASSOCIATION.—Secretary, W. Macaulay, British Linen Company's Bank, Hamilton, N.B.

HANDSWORTH PHOTOGRAPHIC SOCIETY.—Hon. Secretary, A. E. Segnitz, 141 Hall Road, Handsworth.

HASTINGS AND ST. LEONARD'S PHOTOGRAPHIC SOCIETY.—Hon. Secretary, Algernon Brooker, 21A Wellington Place, Hastings.

HELIOS POSTAL PHOTOGRAPHIC CLUB.—Hon. Treasurer and Secretary, H. Everett, 125 St. Paul's Road, Bow, London, E.

HEREFORDSHIRE PHOTOGRAPHIC SOCIETY.—Secretary, C. Gethen, 9 St. Nicholas Street, Hereford.

HOLBORN CAMERA CLUB.—Hon. Secretary, J. Britain, 52 Hilldrop Road, London, N.

HOLMFIRTH AMATEUR PHOTOGRAPHIC SOCIETY.—Treasurer and Secretary, David Bilson, Birchin House, Holmfirth, Yorkshire.

HOVE CAMERA CLUB.—Hon. Treasurer and Secretary, E. E. Manwaring, 75 Lansdowne Place, Hove.

HUDDERSFIELD NATURALIST AND PHOTOGRAPHIC SOCIETY.—Hon. Secretary, A. Clarke, 9 St. Andrew's Road, Huddersfield.

ISLE OF THANET PHOTOGRAPHIC SOCIETY.—Hon. Secretary, J. C. Goldsack, The Elms, Ramsgate.

KEIGHLEY AND DISTRICT PHOTOGRAPHIC ASSOCIATION.—Hon. Secretary, John Gill, 27 Highfield Lane, Keighley.

KENDAL LITERARY AND SCIENTIFIC INSTITUTION (PHOTOGRAPHIC SECTION).—Secretary C. R. Hargreaves, 17 Greenside, Kendal.

KILMARNOCK AND AYRSHIRE PHOTOGRAPHIC SOCIETY.—Hon. Secretary, William Paterson, Northfield Avenue, Ayr.

KINGSBRIDGE CAMERA CLUB.—Hon. Secretary, R. M. Stewart, 56 Fore Street, Kingsbridge.

KING'S LYNN PHOTOGRAPHIC SOCIETY.—Hon. Secretary, H. Lilson, Railway Road, King's Lynn.

KING'S LYNN Y. M. C. A. PHOTOGRAPHIC CLUB.—Hon. Treasurer and Secretary, William Winch, St. James Street, King's Lynn.

KINGSTON-ON-THAMES PHOTOGRAPHIC SOCIETY.—Hon. Secretary, Dr. Finney, Kenless, Kingston Hill, Surrey.

LAKE DISTRICT CAMERA CLUB.—Hon. Secretary, W. H. R. Kerry, Wheatland, Windermere.

LANCASTER PHOTOGRAPHIC SOCIETY.—Secretary, W. Briggs, 21 Cheapside, Lancaster.

LANTERN SLIDE EXCHANGE CLUB.—Hon. Treasurer and Secretary, A. J. Richardson, Summerfield, Dore, Sheffield.

LEAMINGTON AMATEUR PHOTOGRAPHIC SOCIETY.—Hon. Secretary, Signor Aspa, Priory House, Leamington.

LEEDS CAMERA CLUB.—Hon. Secretary, S. Barnes, 16 Lady Lane, Leeds.

LEEDS PHOTOGRAPHIC SOCIEEY.—Secretary, Alfred Nayler, Providence Terrace, Leeds.

LEICESTER AND LEICESTERSHIRE PHOTOGRAPHIC SOCIETY.—Secretary, Thos. Brown, 68 Church Gate, Leicester.

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Photographic Club, The.—Secretary, F. A. Bridge, Dalston Lane, London, N. E.

Photographic Convention of the United Kingdom.—Hon. Secretary, R. P. Drage, 95 Bleinheim Crescent, London, W. Meeting in 1897 at Yarmouth.

Photographic Salon.—Hon. Secretary, A. Maskell, Dudley Gallery, Picadilly.London,W.

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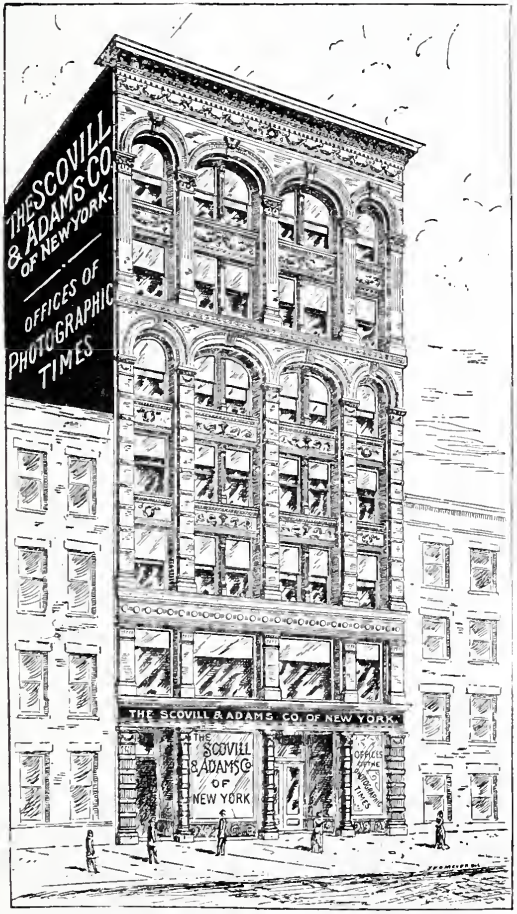
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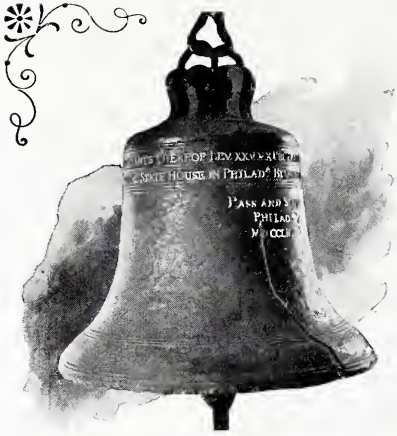
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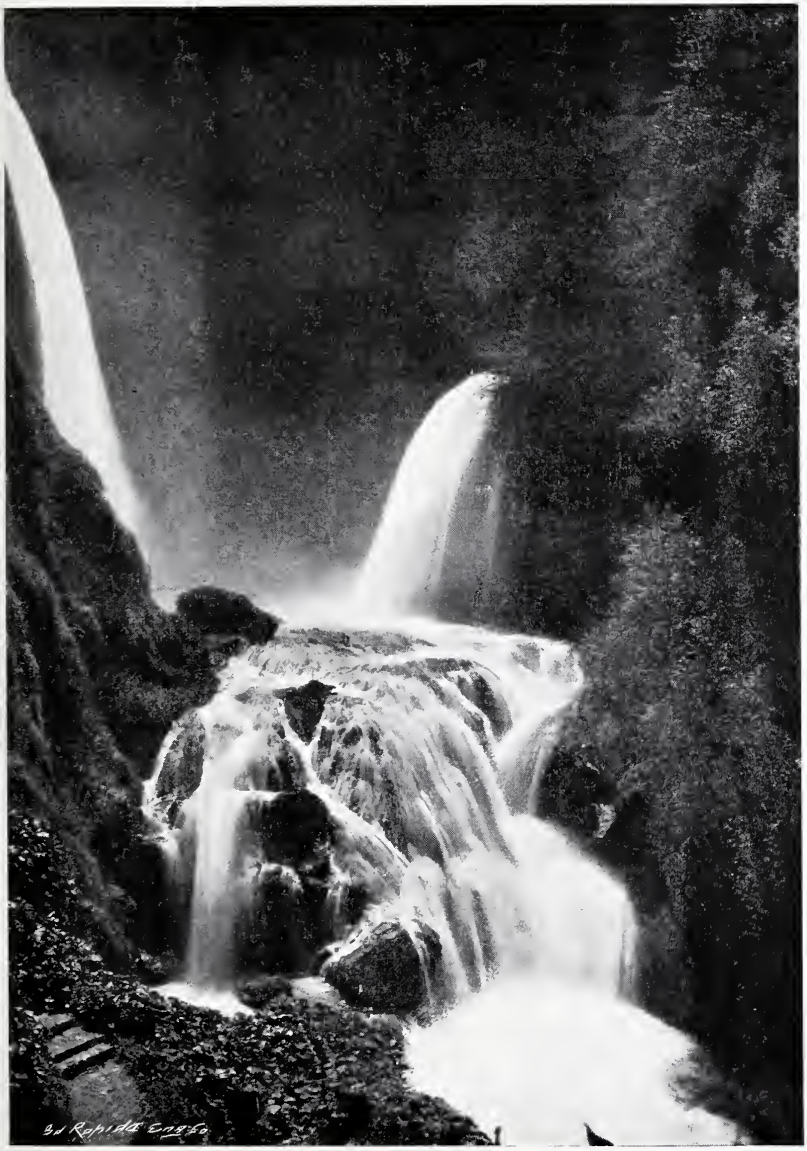
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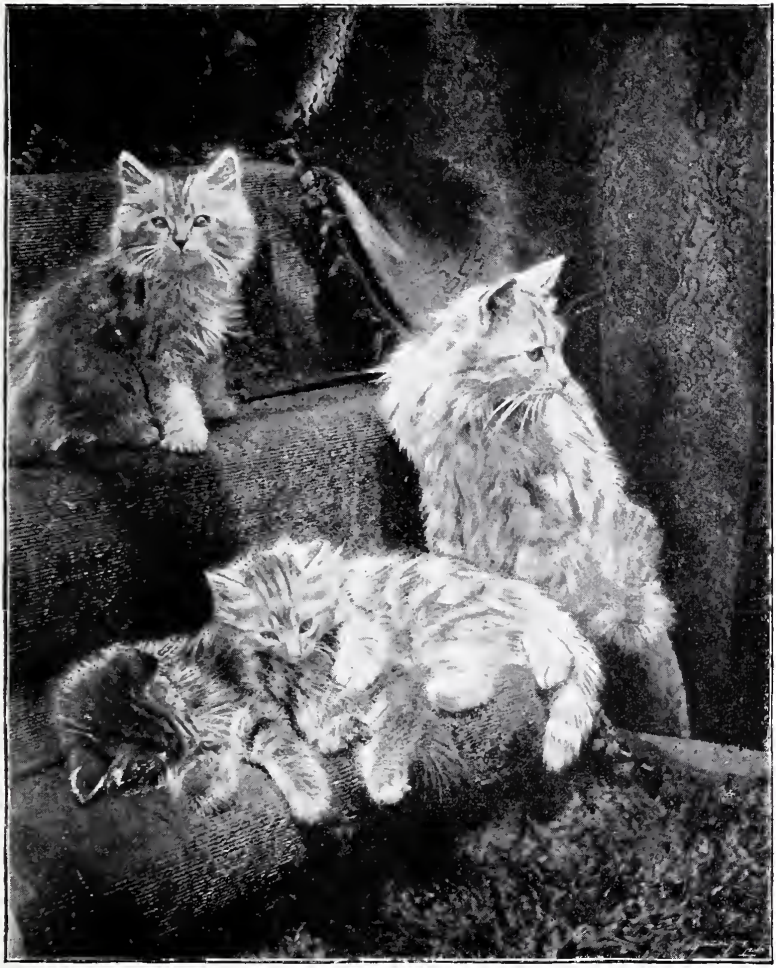
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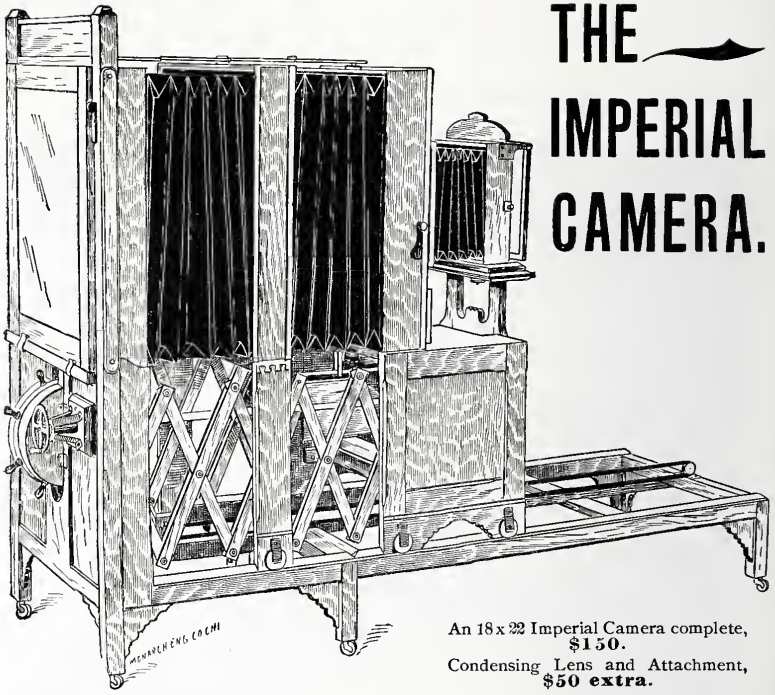
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Exposure $\frac{1}{15}$ sec. Taken by Mr. Edgar Pickard, with a Thornton-Pickard Time and Instantaneous Shutter.

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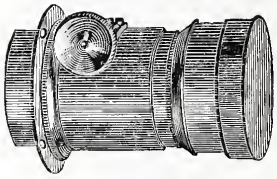
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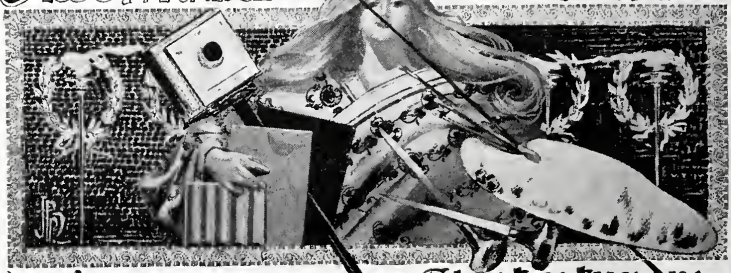
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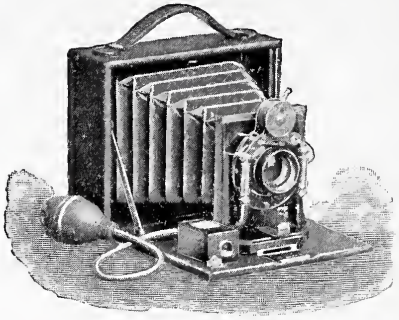
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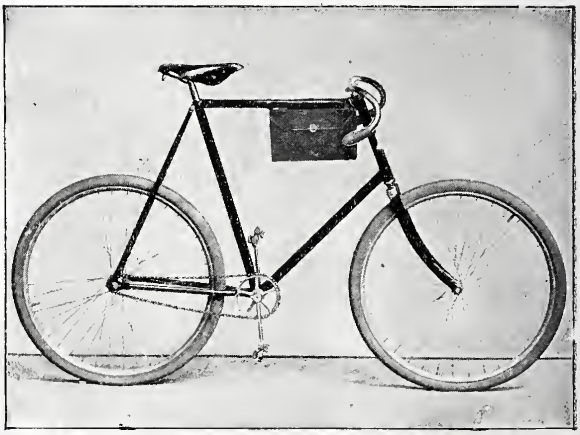
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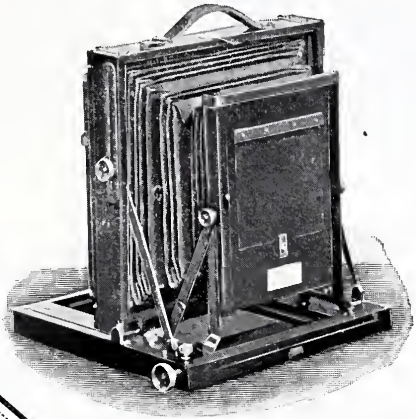
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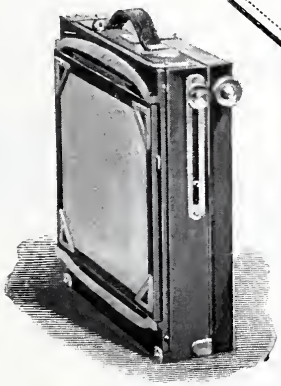
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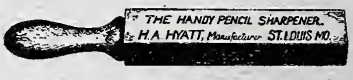
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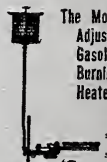
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For Studios Having Electric Light.

When ordering, be sure to state the voltage of your current, and the base or socket your lamp fits.

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The Mound City Adjustable Gasoline Burnisher Heater.



Gives a strong steady heat and is simple and economical producing neither soot, smoke nor smell. It is easy to regulate, and adjustable to any burnisher.

No.	Inch burner	Price
15	" "	$5 00
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We have

A fully equipped, separate department with its own distinctive catalogue, for this line of goods, under the charge of a practical Photo Engraver.

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The Scovill & Adams Co. of N. Y.

The Best Maxims

are the most often repeated, so we will once more call attention to the fact that without the

Scovill-Levy

Photo-Engravers' Adjustable Screen

Plate Holder

none of the finest results can be obtained in the half-tone process.

The holder has the additional advantage of saving a great deal of time and labor, while reducing to the minimum the chances of dropping the costly screen.

THE EXPERT PHOTO-ENGRAVER knows all this very well, for the

Scovill-Levy Holder

is in use in all the leading establishments in this country; but it is the prospective engraver and investor who should heed the advice of the practical workers.

Process Workers

Should remember that success depends on the use of the best Apparatus and Materials, viz. :

Swift Rapid Paragon Lenses,

Which have superseded all other types of Lenses for these purposes.

Scovill's Copying Cameras,

Fitted with the improved Scovill-Levy Photo-Engravers' Adjustable Screen Plate-Holder, without which the best results cannot be obtained in the half-tone process.

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SCOVILL'S IMPROVED ETCHER'S TUB,

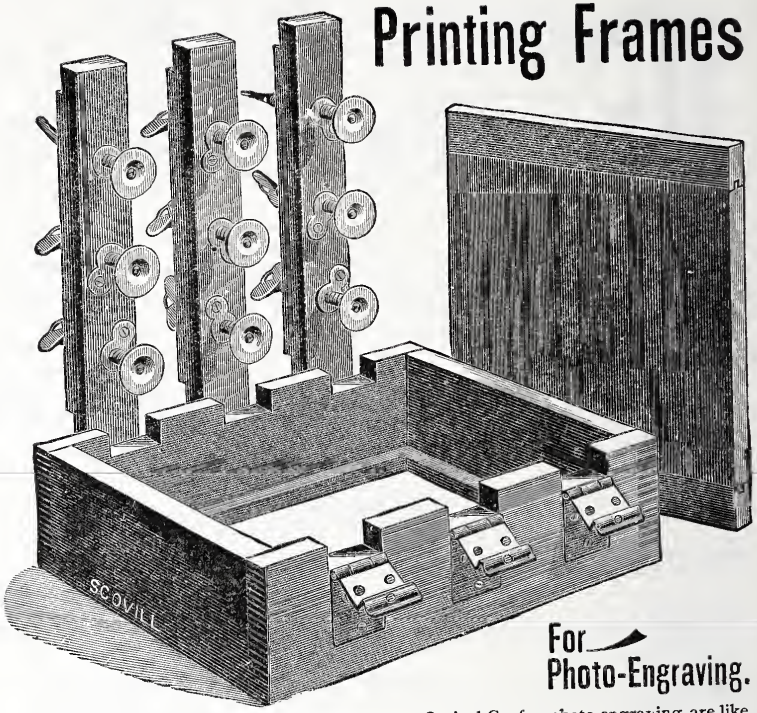
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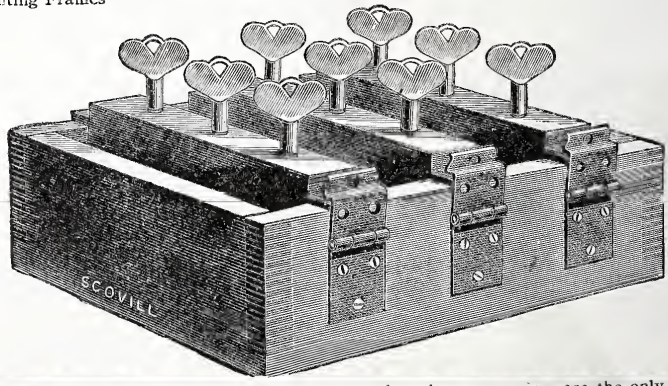
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The Printing Frames made by the American Optical Co. for photo-engraving are like everything else manufactured by this factory, of the highest degree of perfection, and the utmost care was given to the comparative distance of screws so as to produce an even pressure. Many negatives have been either ruined or snapped by the use of imperfect Printing Frames



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PRICES.

8 x 10, including one-inch glass.	$8 00	11 x 14, including one-inch glass.	$13 00
10 x 12, " " "	12 00	14 x 17, " " "	19 00
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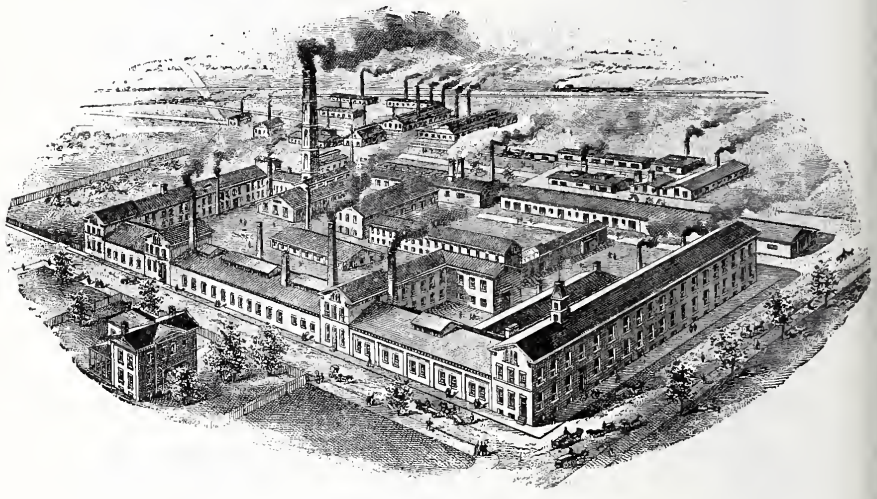
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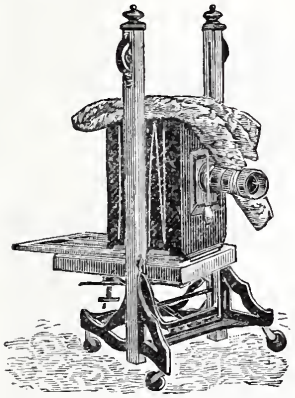
700 PHOTOGRAPHERS

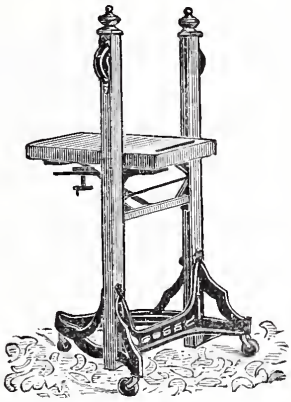
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Put up in boxes containing 96 Tabloids each; enough to develop 8 to 12 dozen 4 x 5 Plates or Films.

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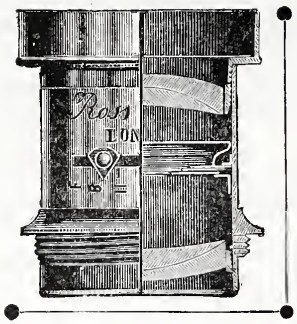
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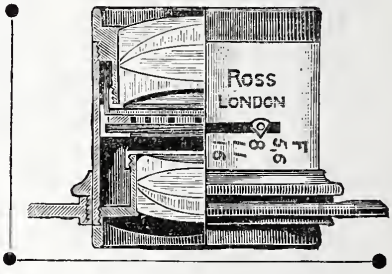
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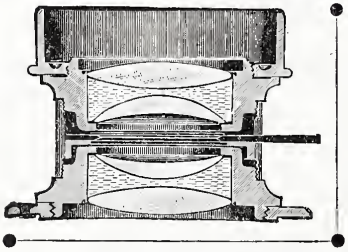
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In great variety.
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FIRST QUALITY American Optical Co.'s CAMERAS

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Bargain Prices.

	List Price.	Bargain Price.
1 5x7 Star View Camera, S. S.	$32 00	$16 00
1 5x7 " " " D. S. B.	35 00	17 50
1 5x8 " " " "	38 00	19 00
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1 6½x8½ " " " "	36 00	18 00
1 8x10 " " " "	40 00	20 00
1 5x7 Revolving Back " Front Focus	33 00	16 50
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1 5x8 " " S. S., " "	35 00	17 50
1 6½x8½ " " " " "	40 00	20 00
1 5x7 Leader Camera "	22 00	11 00
1 5x8 " " "	24 00	12 00
1 8x10 " " "	28 00	14 00
1 4¼x5½ St. Louis Camera "	26 00	13 00
1 4¼x5½ " " D. S. B.	30 00	15 00
1 4¼x6½ " " "	34 00	17 00
1 4¼x6½ " " S. S.	30 00	15 00
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1 5x7 " " S. S.	32 00	16 00
1 5x8 " " "	34 00	17 00
1 6½x8½ " " D. S. B.	40 00	20 00
1 8x10 " " "	44 00	22 00
1 8x10 " " S. S.	40 00	20 00
1 5x7 Elm City Outfit, consisting of Camera, Holder, Case and Tripod.	33 00	16 50
1 6½x8½ Elm City Outfit, consisting of Camera, Holder, Case and Tripod.	40 00	20 00
1 4x5 Flandreau Outfit, consisting of Camera, Holder, Case and Tripod.	20 00	10 00
1 5x7 Flandreau Outfit, consisting of Camera, Holder, Case and Tripod.	25 00	12 50
1 6½x8½ Compact View Camera, consisting of Camera, Holder, Case and Tripod.	25 00	12 50
1 8x10 Compact View Camera, consisting of Camera, Holder, Case and Tripod.	30 00	15 00
1 5x8 Albion Camera, Holder, Case and Tripod.	49 00	24 50
1 6½x8½ " " " " "	50 00	25 00
1 5x7 Economic Camera, S. S.	28 00	14 00
1 5x8 " " "	29 00	14 50
1 6½x8½ " " "	30 00	15 00
1 8x10 " " "	32 00	16 00

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60 & 62 East 11th St., **New York City.**

Lenses Below Cost.



The following list of Lenses are offered at prices which are **ACTUALLY BELOW COST.** They are, of course, strictly CASH prices. Orders will be filled in rotation as received, until the stock is all sold.

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1 8x10 Morrison Full Figure Lens	$90 00	45 00
1 Morrison Lens for Panthascope Camera	25 00	5 00
1 6 in 4-5 Instantaneous Morrison Wide Angle Lens with Shutter	25 00	10 00
1 No. 2 Morrison Leukoscope, 17x20, Portrait Lens	170 00	30 00
1 No. 3 Morrison Leukoscope, 16x18, Portrait Lens	150 00	60 00
1 No. 4 Morrison Leukoscope, 11x14, Portrait Lens	100 00	42 00
1 6 in. Morrison Detective Lens	25 00	8 00
1 8x10 Gundlach W. A. Lens	35 00	22 50
1 5/8 W. D. Lens, of the celebrated makers, Bertiner, of France	30 00	15 00
1 No. 7, Series III, Bausch & Lomb, Zeiss Lens (This is a very special bargain.)	84 00	68 25
1 No. 1, Series IV, Bausch & Lomb, Zeiss Lens (This is a very special bargain.)	27 00	13 05
1 No. 1 Darlot Wide Angle Lens	12 50	6 00
1 No. 2 " " " "	15 00	9 00
1 4x5 Dallmeyer Rectilinear Lens	34 00	20 00
1 No. 1 A A, Dallmeyer Wide Angle Lens	34 00	25 00
1 No. 1 Dallmeyer Wide Angle Lens	34 00	25 00
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1 4-4 C. C. H. Portrait Lens	250 00	100 00
1 2-3 Quick Worker Portrait Lens	75 00	25 00
1 6 in. Wray Lens, W. A. Rev	25 00	15 00
1 8 in. " " " "	45 00	22 00
1 5x8 Single W.A. French Lens	25 00	10 00
2 Brickeman Triple Combination Single View Lens	55 00	21 50
1 2x2 in. M. & V. Lens, Single Extra Rapid	4 00	2 00
1 4-5 in. M. & V. Lens. Single Extra Rapid		
1 4x5 in. S. & A. Lens, Revol. Diaph., Rapid	20 00	10 00
1 16 in. New York Opt. Works, W. A.		58 00
1 4-5 Instantaneous Lens	30 00	15 00
1 5-8 " "	35 00	17 00
1 6½-8½ " "	50 00	25 00
1 8-10 " "	60 00	30 00

	REGULAR PRICE.	REDUCED PRICE.
1 4x5 Laverne Lens and Shutter		$50 00
1 4x3 Single View Lens, R. & P.	$37 50	8 00
1 A. O. Co. Portrait Lens, 8x4	300 00	95 00
1 8 in. C. C. H. Globe Lens	80 00	15 00
1 10 in. " " " "	100 00	20 00
1 6 in. " " " "	54 00	10 00
1 3 in. " " " "	31 00	5 00
1 2½ in. " " " "	27 00	3 50
1 ½ in. " Quick Worker	50 00	10 00
1 2-3 in. " " "	75 00	15 00
1 No. 3 Ratio Lens	350 00	80 00
1 No. 2 " "	160 00	50 00
1 No. 1 " "	45 00	10 00
1 4-5 Optimus Lens, W. D.	25 00	10 00
1 4-5 Rapid Single Lens	20 00	8 50
1 5x7 " " "	32 00	12 50
1 8 in. Wide Angle Lens	33 00	15 00
1 No. 2 Dallmeyer Telephoto Lens	116 00	75 00
1 No. 2 B Steinhill Lens, Series VI	105 00	70 00
1 No. 3 B Steinhill Lens, Series VI	145 00	95 00
1 Pair Steinhill Stereo Lenses	40 00	28 50
1 4x5 Beck Rapid Rectilinear Lens	30 00	20 00
1 4x5 Beck Rapid Rectilinear Lens	25 00	18 75
1 No. 4 Voightländer, W. A. Br. Rev		10 00
1 7-9 Voightländer, Series IV. " Single View Lens	45 00 / 100 00	34 50 / 40 80
1 5 in. Optimus, Br. Rev. Lens	35 00	12 95
1 11 in. " " W. D. "	72 50	30 00
1 3 in. " W. A. Rev	25 00	8 75
1 1-4 size Scovill Portrait Lens, Waterhouse Diaph., Rack and Pinion	8 75	4 00
1 4-4 Scovill Peerless Portrait Lens, plain, nickel-plated.	60 00	20 00
1 5-8 Swift Rapid Paragon Lens	42 00	29 99
1 Pair 1-4 size Scovill Peerless Portrait Lens, Rack and Pinion	18 00	9 00
1 1-4 size Scovill Peerless Portrait Lens, Rack and Pinion, Quick Worker	25 00	16 00
1 Ex. 4-4 Scovill Peerless Portrait Lens, Quick Worker	160 00	75 00
1 No. 5 Dallmeyer Single View Lens, Br. Rot	64 00	35 00
1 6-8 Economic Lens	15 00	7 50
1 8-10 " "	20 00	10 00

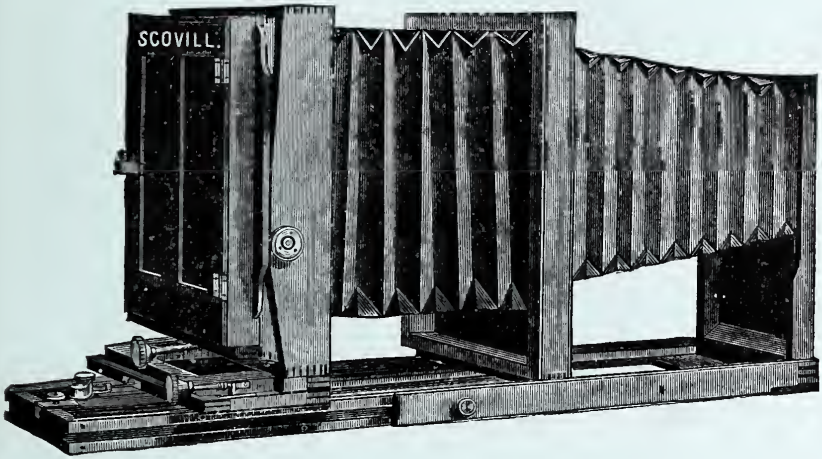
The Scovill & Adams Co. of New York,

60 and 62 East 11th Street, New York.

THE AMERICAN OPTICAL CO.'S

UNRIVALED

PORTRAIT CAMERAS.



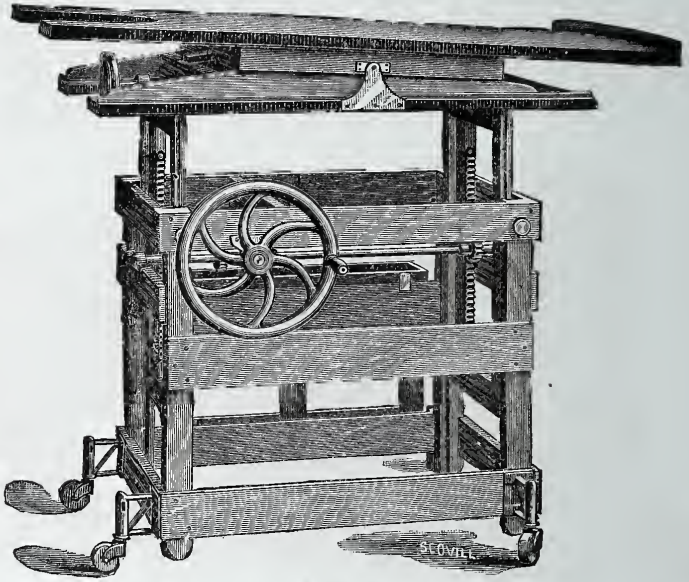
The American Optical Company Portrait Cameras are manufactured from the best mahogany, French polished, and have the Lever Focusing Attachment, by which the most delicate focus can be adjusted with the utmost facility and ease. Above 10 x 12 size, they have double bellows, vertical shifting front, the V-shaped wooden guide, and telescopic platform.

No.	Size.						With Double Swing-back.
5—	8x10 ins.,	with rigid platform		30 ins.	long		$38 00
6—	10x12 "	" "	"	36	"		48 00
7—	11x14 "	extension	"	48	"	double bellows and vertical shifting front,	64 00
8—	12x15 "	"	"	48	"	"	72 00
9—	14x17 "	"	"	60	"	"	76 00
10—	16x20 "	"	"	65	"	"	88 00
11—	17x20 "	"	"	65	"	"	90 00
12—	18x22 "	"	"	70	"	"	100 00
13—	20x24 "	"	"	72	"	"	110 00
14—	22x27 "	"	"	72	"	"	130 00
15—	25x30 "	"	"	80	"	"	170 00

Buy from Dealers or the Scovill & Adams Company.

THE "ELITE" STUDIO STAND.

(PRIZE WINNER.)



Patented.

These are the only Stands suited in workmanship and finish, also in size, to the large American Optical Co.'s Cameras, with their great length of bellows and extension platform. Practical portraitists cannot fail to admire the ease with which these stands can be adjusted at any desirable height or inclination, and the noiseless manner in which they may be moved from place to place, their elegant appearance and accurate construction.

Instead of the clumsy levers and racks, by which accurate adjustment of the platform was obtained in the older stands; the proper elevation and inclination are produced in the "Elite" stand by cog-wheel and snake screw, and the manipulation at one side by a wheel with handle, and within reach of the operator, so that he may adjust the height or inclination of this camera without taking his head from under the focusing cloth. By means of the wheel worked at the rear end of the platform, the horizontal position of the platform may be inclined upward or downward to a limit of 15 degrees. A great advantage from this movement, we observe, is that a true horizontal position—so difficult to obtain in the old camera stands—is, with these, an easy matter to effect. This is especially important to those who may use them for reproduction work. In the No. 2 size the platform is fifty-two inches long and twenty-five inches wide, and its length may be increased to seventy inches by an attachment which slides out forward, making it quite long enough for supporting a large copying camera. Then a semi-circular cut-out, to the rear end of the platform, is a convenience to the operator, who is thus enabled not only to stand closely up to the ground glass, no matter how far the camera may have been pushed forward, but bending of the body is obviated, which is quite a necessity with all the older stands.

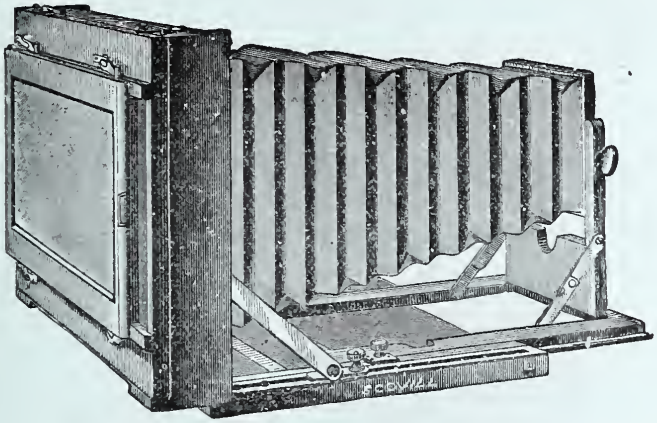
"ELITE" STUDIO STANDS

	No. 1 Size.	No. 2 Size
PRICE, with Rack and extension for Plate Holder	$32.00	$36.00
Highest point from platform to floor	48	48
Lowest " " " "	32	32
Width of platform	22	26
Length of platform without attachment	45	52
" " with "	60	70

For Sale by all Dealers in Photographic Materials and The Scovill & Adams Company.

IRVING VIEW CAMERAS.

The IRVING Camera recently introduced by the American Optical Co. was awarded the highest prize by the judges at the American Institute Fair. They expressed themselves as unable to see how a more complete, compact, light, handsome and serviceable camera could be made.



The Irving Cameras all have swing front in addition to swing back, vertical shifting front board. They have the Howe patent reversible back, fitted with self-locking ground-glass frame, and when desired, celluloid is used in place of glass for the focusing screen.

One of the best features of the camera is the absence of detachable screws. An idea of this is conveyed by the illustrations showing the camera when extended and when folded.



A superb canvas case, the finest ever made, is supplied with each one of the Irving Cameras. Price list is as follows:

	Single Swing.	Double Swing.		Single Swing.	Double Swing.
4 x 5	$27.00	$32.00	10 x 12	60.00	$65.00
5 x 7	33.00	38.00	11 x 14	65.00	70.00
5 x 8	35.00	40.00	14 x 17	75.00	80.00
6½ x 8½	40.00	45.00	17 x 20	85.00	90.00
8 x 10	45.00	50.00	18 x 22	95.00	100.00

In order to convey an idea of the lightness of these cameras, it is sufficient to say that the 5 x 8 size camera weighs only 3 lbs.

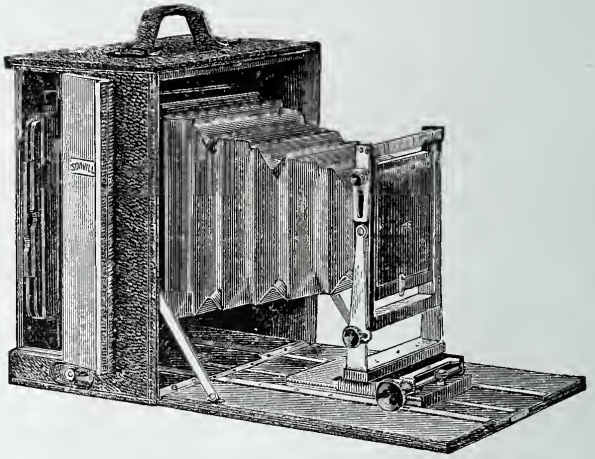
For Sale by all Dealers in Photographic Materials and The Scovill & Adams Company.

"A Fin de Siècle" Camera.

The end of this century is marked by many useful inventions, among them is the new

IRVING-CLAY CAMERA

Manufactured by THE AMERICAN OPTICAL CO.



This Camera is a combination of the best features of the well-known "Henry Clay" and "Irving" Cameras, and is, therefore, the only Hand and Tripod Folding Camera with **reversible self-adjusting spring back,** and the other features characteristic of these two Cameras.

. . PRICE. . .

Size, 6½x8½, with two (2) double holders, - - $45 00	Size, 8 x 10, with two (2) double holders, - - $50 00

= = FOR SALE BY ALL DEALERS = =

AND

The Scovill & Adams Company of New York.

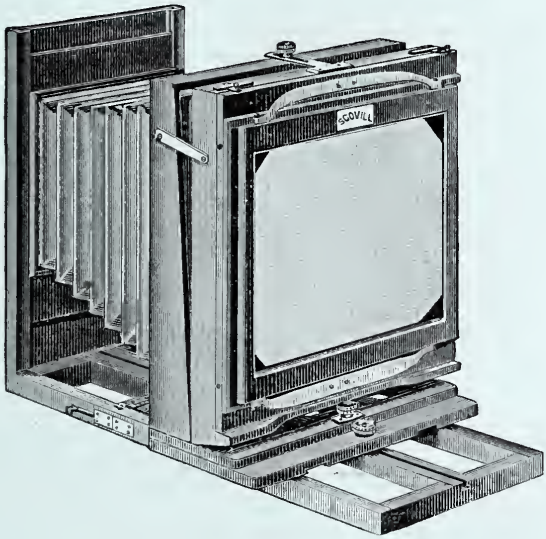
A NEW CAMERA.

"The Reversible Landscape,"

Made by the AMERICAN OPTICAL CO.,

To meet the demand for high-grade apparatus at popular prices.

This Camera is made of highly polished mahogany, with all the latest improvements, and patent self-adjusting ground glass frame, reversible back and rising front.



. . PRICES. . .

6½ x 8½	Double Swing,	- - - -		$23 00
8 x 10	"	"	- - -	25 00
11 x 14	"	"	- - - -	35 00
14 x 17	"	"	- - -	50 00

- - FOR SALE BY ALL DEALERS - -

AND

The Scovill and Adams Company of New York.

The Scovill Adjustable Tripod.

(FEATHER WEIGHT.)



Nothing more compact, certainly nothing as graceful in appearance and light in weight as the new Tripod for out-door Photography, just produced by the American Optical Company, has yet made its appearance. Because so readily adjusted to the utmost irregularity of the earth's surface, it was decided to call it the "Adjustable Tripod." Lady amateurs prefer it to any other pattern on account of its lightness and beauty. The top is covered with billiard-cloth to prevent marring the fine polish on our cameras, and the clamping screws are not detachable.

SCOVILL ADJUSTABLE TRIPOD.

No. 1..... Price, each, $3.50
" 2..... " " 5.00

Scovill Adjustable Jointed Tripod, to fold and pack in a 22-inch Valise..... $4.00
Do. with Canvas Bag and Handle.. 4.75



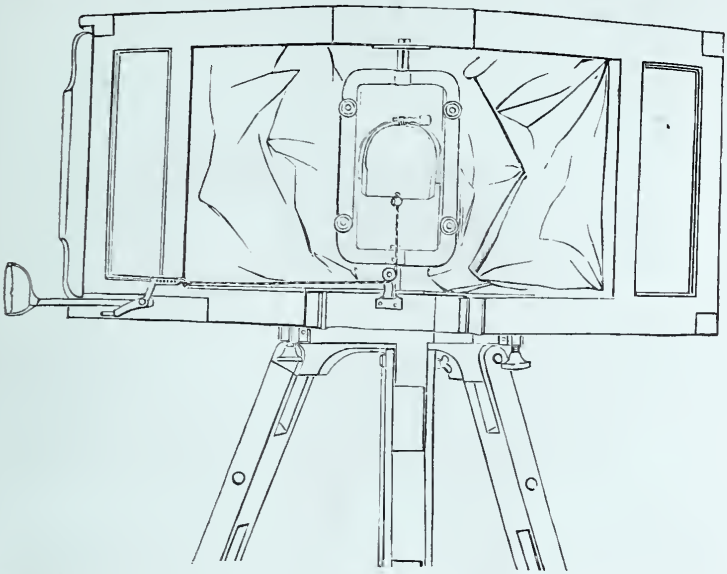
THE IMPROVED TAYLOR TRIPOD.

The illustration here presented makes an extended description unnecessary. Suffice it to say that this tripod is very firm when set up, and folds up compactly by simply pressing together the two upper joints of each leg, thus unsetting them from the pins on the brass top and then doubling them over on to the third joint. This movement is naturally reversed when placing the tripod in position to support the camera.

Price, with metal disc and non-detachable screw.....$2.25 each.

Adapted for cameras from 1-4 to 8x10 size.

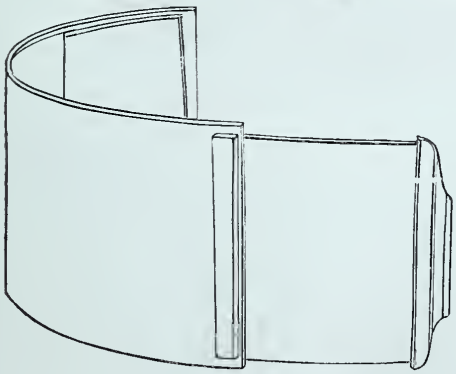
The Scovill Panoramic Camera.



WE take pleasure in introducing to the photographic fraternity our new Panoramic Camera, which is made in various dimensions up to the size capable of making photographs 18 x 48 inches.

A new design of constructing these cameras in hemispherical form has been invented; a new movement of crossing the lens over the segments of the circle, and an automatic release for the shutter has also been constructed. Carbutt's No. 27 films, or his orthochromatic films of the same sensitiveness, are used by means of an ingeniously constructed flexible dark slide, which permits of the necessary curve to conform with the back of the camera. The cameras are solidly and serviceably made, elegant in finish, and in every way maintain the world-wide reputation of the American Optical Company. The cuts shown herewith give an idea of the external appearance of the camera, and the dark slide for holding the film.

The prices of these cameras, including in each case a substantial wooden box or trunk for holding the instrument, a suitable tripod, a panoramic printing frame, two holders, two developing baths, and the celebrated Swift lens, are given below.



Price of The Scovill Panoramic Outfit for making photographs 10x30 inches, complete as above, - - - - $250

Price of The Scovill Panoramic Outfit for making photographs 16x43 inches, complete as above, - - - - 300

THE

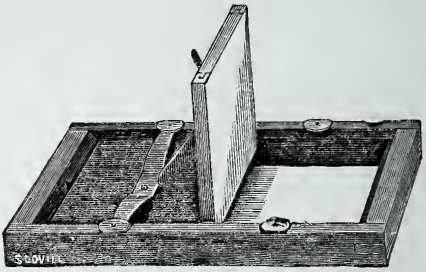
SCOVILL & ADAMS COMPANY,

60 & 62 East 11th St.,

New York City.

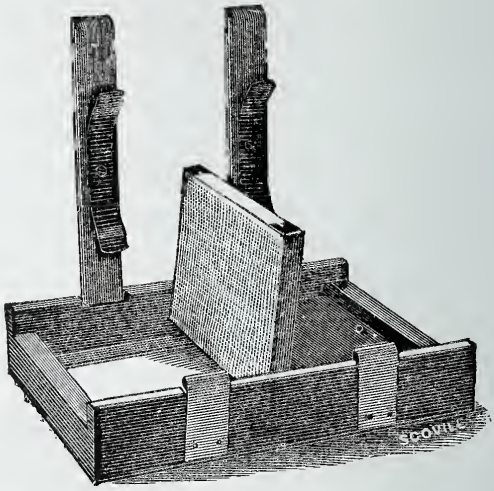
Scovill Printing Frames.

Manufactured of Cherry, with Brass Springs, Paneled Backs and Tally.



Scovill Flat Printing Frame (Open).

Our Printing Frames are constructed so that a uniform pressure is obtained, thus insuring perfect contact between the positive paper and negative plate. The back-boards are so arranged that the progress of the printing may be watched without danger of shifting the paper.



Scovill Deep Printing Frame (Open).

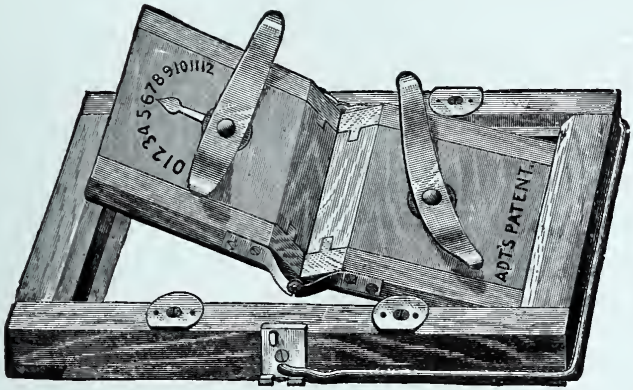
For Plates	Flat.	Deep.
3¼ x 4¼	$0 36	$0 75
4 x 5	38	75
4¼ x 5½	40	75
4¼ x 6½	42	85
5 x 7	50	85
5 x 8	52	1 00
6½ x 8½	60	1 25
8 x 10	75	1 50
10 x 12	1 00	1 75
11 x 14	1 85	2 50

For Plates	Flat.	Deep.
13 x 16	$2 05	$2 75
14 x 17	2 45	3 00
16 x 20	3 10	4 25
17 x 20	3 30	4 60
18 x 22	4 20	5 20
20 x 24	5 10	5 50
24 x 30	..	9 00
35 x 45	..	16 00
30 x 60*	..	22 00

*Larger or special sizes made to order at short notice, according to specification.

When made with backs to open lengthwise, ten per cent. is added to the foregoing prices for the respective sizes.

ADT'S PATENT PRINTING FRAMES.



These Frames are now supplied (without extra charge) with Adt's Patent Support with which the frame can be stood on either end, and at four different angles, for exposure while printing. It is out of the way of the printer when introducing the paper, or examining the print, for when the frame lies or is held with back up, the support instantly drops upon its stops for rest, and is entirely out of the way of the hand of the printer, so that he may remove or open the back-board, or replace it, as if there were no support present. Being arranged close around the sides and ends of the frame, it occupies so little space as not to interfere with the packing or storage of the frames, and when the printer places his frame for exposure the support readily finds its position for supporting the frame without any special manipulation.



PRICES.

3¼ x 4¼	$0 50
4 x 5	50
4¼ x 5½	50
4¼ x 6½	60
5 x 7	65
5 x 8	65
6½ x 8½	75
8 x10	85
10 x12	1 15
11 x14	2 15
13 x16	2 40
14 x17	2 80

When made with back to open lengthways, an additional charge of 10 per cent. will be added to the above prices.

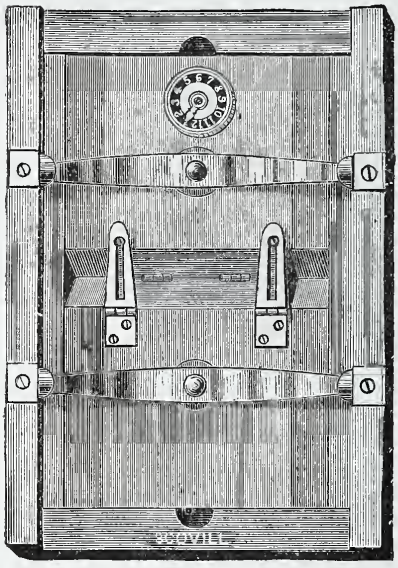
As will be seen by a glance at the cut, the adjacent edges of the parts of the back-board are beveled outward, and the hinges placed on the sides with their axes on a line with the surface. This permits the attachment to the face of the back-board of a **Heavy, Continuous Elastic Felt Pad.** This obviates the necessity of using a separate pad, which is so easily misplaced and lost.

For Sale by all Dealers in Photographic Materials and The Scovill & Adams Company.

IRVING PRINTING FRAMES

WITH ADJUSTABLE SUPPORTS.

(PATENTED.)



IRVING PRINTING FRAME, CLOSED
FRONT VIEW.



IRVING PRINTING FRAME, OPEN.
BACK VIEW.

The IRVING FRAMES have valuable features which cannot be copied. They are in workmanship, design, and other respects, superior to all other printing frames.

The continuous felt pads made especially to order for us, insure absolute protection and uniform pressure throughout. The Irving Patent Catches lock the back, so that when one flap is open there is not the slightest danger of the flaps, paper or negative slipping.

The springs are cut by dies of specially tempered and tested metal, and are riveted to the backs with washers underneath to protect the woodwork.

The IRVING FRAMES are made of cherry guaranteed not to warp or crack.

The tally does not depend upon any other part of the frame to lock it, for the pointer will remain in place no matter what is done to other parts of the frame.

Prices for Half or Two-thirds Opening Styles.

3¼ x 4¼	$.45	5 x 7	$.60
4 x 5	.48	5 x 8	.65
4¼ x 5½	.50	6½ x 8½	.70
4¼ x 6½	.55	8 x 10	.80

When made with backs to open lengthways, ten per cent. is added to the foregoing prices, for the respective sizes.

For Sale by all Dealers in Photographic Materials and The Scovill & Adams Company.

THE HENRY CLAY ... Series of Cameras.

MADE BY THE
AMERICAN OPTICAL COMPANY.

The Henry Clay series now consists of three successive grades of Folding Cameras, viz.:

: The Henry Clay Regular,
: The Henry Clay, Jr., and
: The Henry Clay Second.

The Henry Clay Second,	$15 00
The Henry Clay Second, with Double Combination Lens,	20 00
The Henry Clay, Jr., 4 x 5 size,	30 00
The Henry Clay Regular, 5 x 7 size,	55 00
The Henry Clay Stereoscopic,	75 00

OTHER SIZES TO ORDER.

For full particulars of each of these Folding Hand Cameras, send for a copy of the illustrated manual devoted to

THE HENRY CLAY SERIES.

- - FOR SALE BY ALL DEALERS - -

AND

The Scovill & Adams Company of New York.

THE WATERBURY ...

Series of Cameras.

MADE BY THE
AMERICAN OPTICAL COMPANY.

The Waterbury Camera series now includes three cameras:

The Waterbury Detective Camera,

◆ For Dry Plates and Cut Films only.

The Waterbury "Triad,"

◆ Which is the same camera, with the additional feature of a roll holder for Transparent Films, and the

"New Waterbury,"

◆ Just placed upon the market to meet the recent cry for "good goods at low prices."

The New Waterbury, ...	$15 00
The Waterbury, Regular, ...	25 00
The Waterbury "Triad," with roll holder, . .	35 00

For full particulars of each of these Standard Hand Cameras, send for a copy of the illustrated manual, devoted to

THE WATERBURY SERIES.

- - FOR SALE BY ALL DEALERS - -

AND

The Scovill & Adams Company of New York.

FOR SILVERING,

THE WATERBURY TRAYS ARE THE BEST AND CHEAPEST.





These Trays are made by the

AMERICAN OPTICAL CO.

which of itself is a guarantee of the superiority of the wood-work.

Canvas is not required for the seams, as the bottoms are seamless. The bottom rests on cross-strips—a great improvement, for steadiness, over knobs at the corners, which were liable to be broken off.

THE

Waterbury Trays

are guaranteed not to warp or crack.

PRICE LIST.

		Each.
15x19	Waterbury Trays.....	$3 50
19x24	" "	5 00
22x28	" "	6 50
25x30	" "	9 00

For Sale by all Dealers in Photographic Requisites, and by

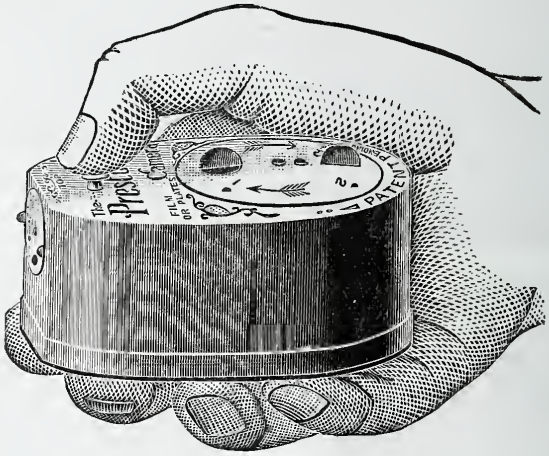
THE SCOVILL & ADAMS COMPANY.

The PRESTO

IS a small pocket camera that makes **big** pictures—**good ones, too; fifty of them at one loading if desired.** It combines in an improved form the most desirable features of the large high-priced cameras, but is small enough in size to fit the pocket **comfortably.**

It is neither a useless toy nor a complicated mechanism. Its high grade and many new, good points will be appreciated by experienced photographers. Its extreme simplicity makes it practical for beginners who have never operated a camera, or who have tried others without success—sound in construction and simple in manipulation—**a child can operate the Presto.**

It is handsomely finished in oxidized silver; of light seamless metal. The PRESTO is the Real Pocket Camera.



A Midget in Size!

A Giant in Capacity!

(The PRESTO measures 1⅜ x 2⅛ x 3¼ inches, it makes pictures 1¼ x 1¼ inches, and weighs five ounces).

FILMS or GLASS PLATES can be used at will.

50 negatives can be made at one loading of film.

4 negatives on glass plates can be made at one loading.

Send for Booklet fully describing the Presto.

The Pocket Presto Camera.

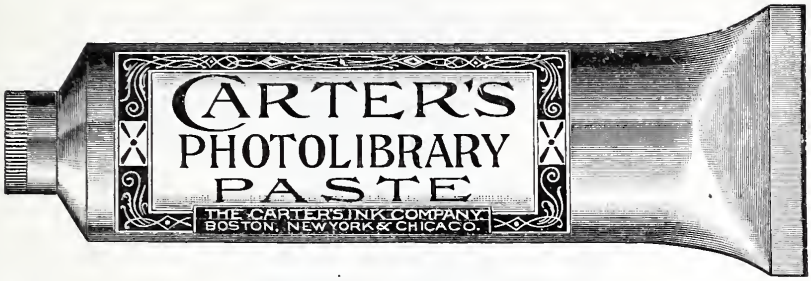
Handsomely Finished and loaded for Twenty-five Exposures, together with one Film Magazine and one Glass Plate Magazine and Primer, with full instructions, securely packed.

PRICE $2.50. By express to any address on receipt of price.

FOR SALE EVERYWHERE.

THE SCOVILL & ADAMS COMPANY OF NEW YORK,

SOLE TRADE AGENTS.



REDUCED 3 OZ. COLLAPSIBLE TUBE.

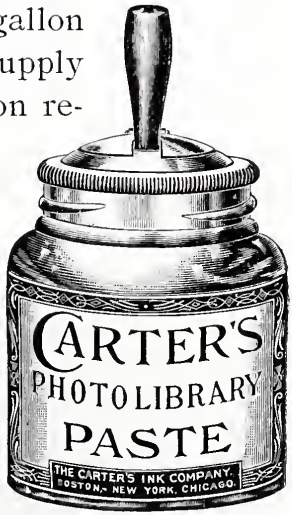
IT is a powerful adhesive, quick in action, pure white in color, and delightfully scented. It spreads smoothly, will not cockle or sour, is uniform and always ready for use. It is specially adapted to photographic work, and the outfit of an amateur photographer is not complete without it.

The Paste is put up in full capacity, attractive packages, ranging from the five cent two ounce cylinder to the gallon jar. If your dealer cannot supply you, we will send you, upon receipt of thirty cents, a 7 oz. jar by express prepaid.

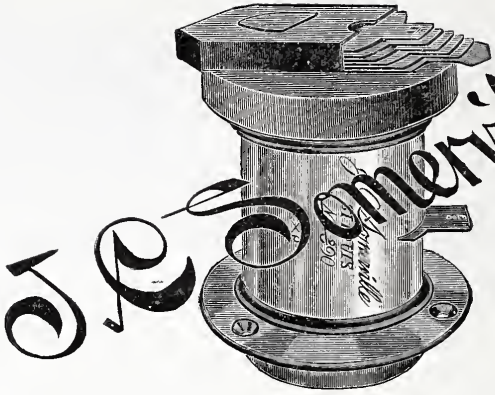
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BOSTON,

NEW YORK. ~ CHICAGO.



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Photo-Supply Co.

MERCHANTS IN ALL PHOTO REQUISITES.

Somerville's New A Series Symmetrical Lens,

With New Improved Iris Diaphragm and Removable Hood.
Be sure to TRY one before you BUY.

These new lenses consist of two achromatic and symmetrical combinations and are designed for general use. **Portraits, Groups, Architecture, Landscape** and **Instantaneous Work.** They have unusual speed, which commends them particularly for ordinarily lighted studios, and owing to their high optical correction, combine the most important features of a photographic lens, viz,: **delicate definition, uniform illumination**, and **good depth.** Their covering capacity is unexcelled. and with full aperture show only a barely appreciable amount of distortion.

By unscrewing the front combination the back only may be used, giving about twice the focus and covering capacity, with about one-half the speed. These lenses have an angle of about 65 degrees.

No.	Diameter.	Back Focus.	For Plate.	Price
0	1 inch	5¼ inch	4x5	$15.00
1A	1¼ "	7¼ "	5x7	20.00
2A	1½ "	8 "	6½x8½	25.00
3A	2 "	11 "	8x10	40.00
4A	2¾ "	15 "	10x12 or 11x14	50.00
5A	3 "	18 "	11xJ4 or 14x17	60.00
6A	3½ "	23 "	14x17 or 18x22	75.00

OUR NEW 90 DEGREE WIDE ANGLE LENS.

No. 1	⅞ in. diameter, 6½ in. focus,	for 6½x 8½ plate,	16.00
No. 2	1⅛ " " 7½ "	" " 8 x10 "	20.00

Will be sent subject to 5 days' trial, and if not satisfactory returned at our expense.

J. C. SOMERVILLE PHOTO-SUPPLY CO.,

410-412 N. Broadway, St. Louis, Mo.

TRY THE

ARGENTIC PLATES

FOR POSITIVE PICTURES.

No bath required.

Will dry over a flame.

Produce excellent results.

Just what you want.

American Dry Plates of all degrees of speed.

No. 17—For Copying and Landscapes.
No. 40—For Portrait and outside work.
No. 50—For Portrait and Instantaneous Exposures.

Non-Halation Plates
Stripping Plates
} to order.

AMERICAN DRY PLATE CO.

Worcester, Mass., U. S. A.

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BLANCHET FRÈRES & KLÉBER,

RIVES-ISÈRE, FRANCE.

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WUESTNER'S

EAGLE DRY PLATES.



Commence with Emulsion No. **5000** and are made in three grades of speed.

X Slow.
X X Medium.
X X X Quickest Plate Made.

OUR PLATES

are of Exquisite Quality, leading all others in Speed and Brilliancy combined.

WE Challenge any PLATE in the World to a test alongside of

OUR

"CYCLONES" XXX.—For Snap Shots and Quick Studio Work.

"JERSEY BEAUTIES" XX.—For Landscapes and General Viewing.

ORTHOCHROMATICS X, XX, & XXX.—For Color Value Effects.

"Imperial" Orthochromatic Non-Halation.—For Interiors, Silverware, Machinery, and Snow Scenes.

PROCESS PLATES.—For Black and White Clear Line Negatives for Photo-Lithographers, Engravers and Zinc Etchers.

Regular and Orthochromatic

STRIPPING PLATES and LANTERN SLIDES.

Convince yourself of their Superiority.

For Sale by all Dealers.

WUESTNER'S

EAGLE DRY PLATE CO.,

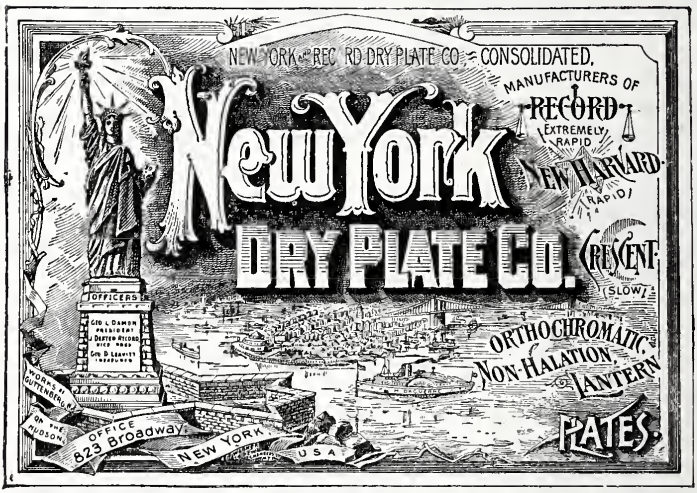
Jackson Place, JERSEY CITY, N. J.

THE NEW YORK PLATE

IS THE **FAVORITE** FOR

Amateurs and Professionals

on account of its gread speed, brilliancy,
ease of working and general excellence.



RECORD	Brand for	Quickest	Work.
NEW HARVARD	"	Ordinary	"
CRESCENT	"	Slow	"

SOLD BY ALL PHOTO STOCK DEALERS.

MAX LEVY'S

PERFECTED ENGRAVED GRATINGS

FOR THE HALF-TONE PROCESS.

Patented in the United States and England, Feb. 21st, 1893.

ORIGINAL RULINGS, ENGRAVED LINES,

The only Perfect Appliance for making Half-tone Negatives.

Perfectly black lines,
Perfectly transparent spaces,
Perfectly sharp edges.

Over 3,000 in use in the best establishments throughout the world.

All sizes from 3¼ x 4½ to 32 x 38 inches.
All rulings from 50 to 300 lines per inch.

Manufactured by

MAX LEVY,

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FRANKFORT a/M—Fr. Hemsath, Rodcrberweg 135.
AUSTRALIA—L. Gershel, Melbourne.
JAPAN—R. Konishi, Tokio.

ILLUSTRATED PRICE LIST ON APPLICATION.

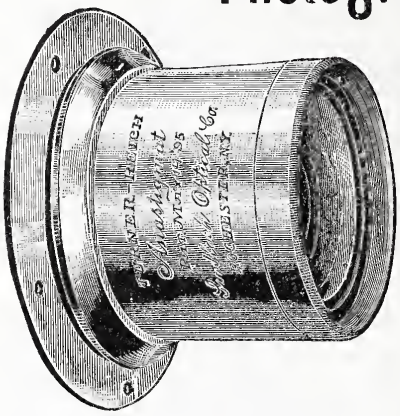
HENRY H. TURNER, PREST. JOHN ZELLWEGER, VICE-PREST. J. C. REICH, SEC. & TREAS.

GUNDLACH OPTICAL CO.

ROCHESTER, N. Y.

MANUFACTURERS OF

Photographic Lenses



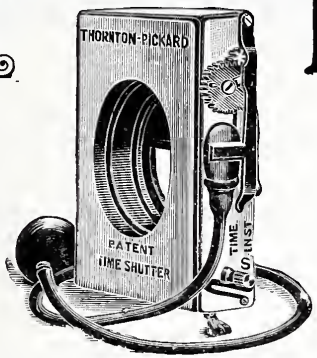
Shutters
Microscopes
Telescopes
Etc., Etc.

WHEN buying a Camera be sure it is fitted with one of our Lenses and Shutters and you will then have the best to be had.

Our TURNER-REICH ANASTIGMAT is the best lens on the market.

SEND FOR CATALOGUE.

THORNTON-PICKARD SHUTTERS.

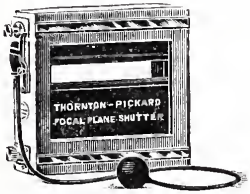


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Gives any exposure, from fractions of a second to hours, without vibration. Same shutter can be fitted to two or more lenses. Largest sale in the world.

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The most rapid shutter made. Recommended for high speed work. Adjustable from $\frac{1}{20}$ to $\frac{1}{1000}$ of a second. Fits at back of camera.

"Lloyd Special" Lenses.

First-class low priced photographic lenses. Gold medal awarded, Mechanic Fair, Boston, 1895.

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A new, brilliant and absolutely uniform paper.

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Sole Wholesale Agents U. S. A.

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The Photochrome Engraving Co.

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HIGH GRADE



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MAKERS OF PROCESS PLATES
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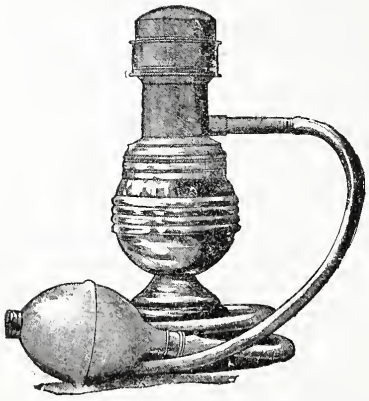
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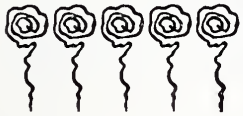
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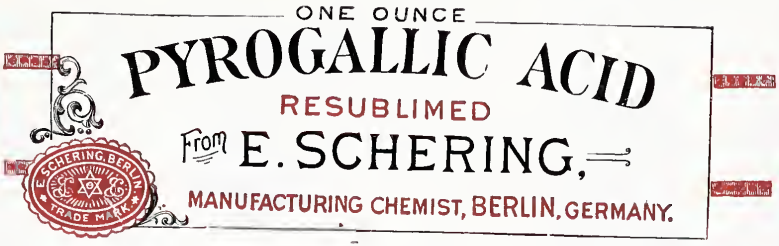
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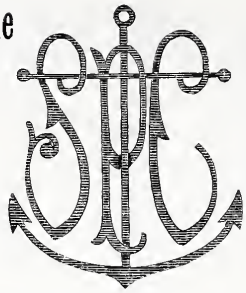
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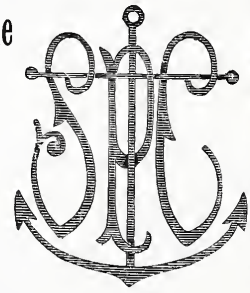
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No. 2 DEVELOPING—SODA.
(Composed of Sulphite of Soda, Carb. Soda and Carb. Potash.)

Nos. 1 and 2 when mixed, as directed on the label, constitute the "Developing Solution," or, as sometimes called, "Developer."

No. 3. FIXING AND CLEARING.
(Composed of Sulphite of Soda, Acid Citric, Chrome Alum.)

No. 4. FIXING AND CLEARING.
(Consists of Hyposulphite of Soda.)

Nos. 3 and 4, when mixed, according to instructions on the label, make the Fixing and Clearing Bath, which can be kept for stock solution if so desired.

No. 5. TONING FOR PRINTS—GOLD CHLORIDE.

No. 6. TONING FOR PRINTS—SODA.

Nos. 5 and 6 constitute the Toning Bath; this must be alkaline.

No. 7. PRINT FIXING—HYPOSULPHITE OF SODA.
This can also be used advantageously for stock solution, a few drops of Aqua Ammonia greatly enhancing its value.

No 8. BROMIDE OF POTASH.
For checking the too rapid development of over-exposed plates.

Any of the above Tablets can also be procured separately.

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No. 2. DEVELOPING—SODA.
(Composed of Sulphite of Soda, Carb. Soda and Carb. Potash.)

No. 3. FIXING AND CLEARING.
(Composed of Sulphite of Soda, Acid Citric and Chrome Alum.)

No. 4. FIXING AND CLEARING.
(Consists of Hyposulphite of Soda.)

No. 8. BROMIDE OF POTASH.
For checking the too rapid development of over-exposed plates.

Our Nos. 1 and 2 Developing Tablets are so prepared that those who are in the habit of immersing the plates with Pyro solution first and then adding the Soda, can do so. Our formulas Nos. 3 and 4, for Fixing and Clearing, are of such combination that we dispense entirely with the Alum Bath, thus requiring only two trays to develop and fix the plate.

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No. 5. TONING FOR PRINTS—GOLD CHLORIDE.

No. 6. TONING FOR PRINTS—SODA.

Nos. 5 and 6 constitute the Toning Bath; this must be alkaline.

No. 7. PRINT FIXING—HYPOSULPHITE OF SODA.
This can also be used advantageously for stock solution, a few drops of Aqua Ammonia greatly enhancing its value.

Any of the above can also be secured separately in bottles of 100 tablets each.

Price for Print Toning Outfit, $1.75.

Explicit Instructions will be found in the General Pamphlet contained in each outfit.

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Amidol Cartridges (Andresen's) making 16 ounces of Developer.

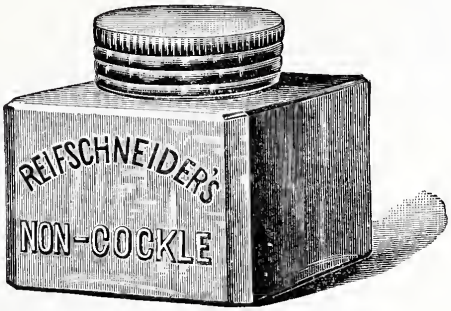
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WIDE-ANGLE VIEW LENSES.



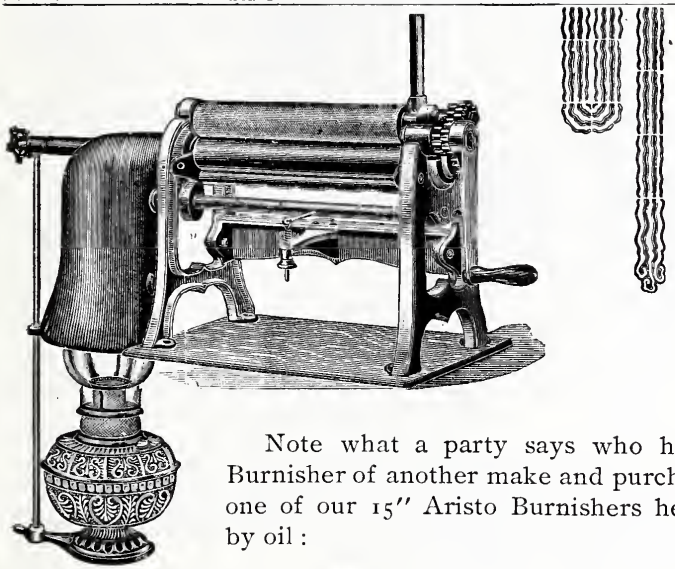
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4	1 "	5 x 8 "	5½ inch, each,	25 00	These 3 sizes will fit into 1 flange.
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6	1 "	8 x 10 "	8 " "	30 00	
7	1¼ "	11 x 14 "	10½ " "	40 00	These 2 sizes will fit into 1 flange.
8	1¼ "	14 x 17 "	14 " "	50 00	
9	1½ "	17 x 20 "	17 " "	60 00	These 3 sizes will fit into 1 flange.
10	1½ "	20 x 24 "	22 " "	80 00	
11	1½ "	25 x 30 "	28 " "	100 00	

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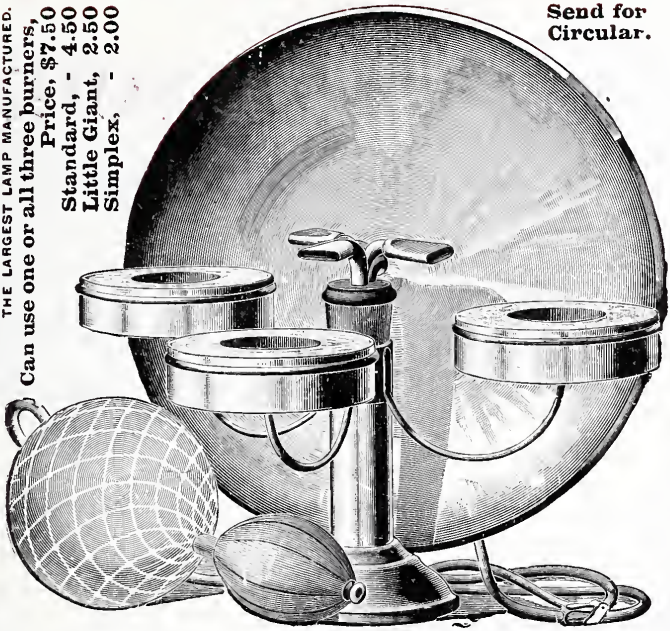
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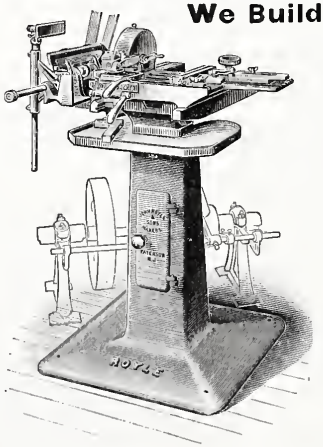
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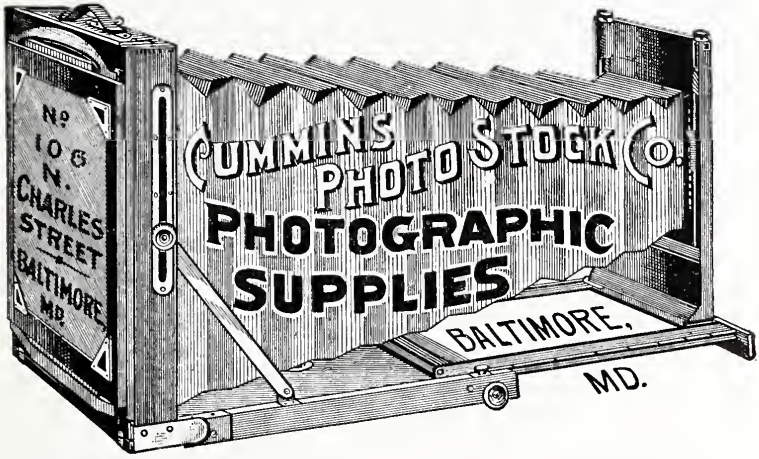
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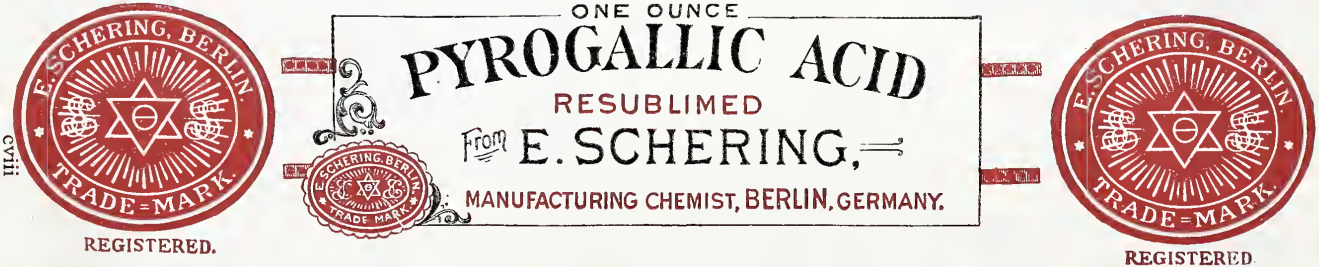
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Requires a negative of ordinary density—is toned with the double baths of gold and platinum—yields clear, brilliant prints without a trace of yellowness. Price, Cabinet size, $2.00 per gross ; other sizes in proportion.

RIVO COLLODION PAPER

Does not crack or chip, and curls less than any other collodion paper on the market It yields excellent results with ordinary negatives, printing without harshness, and giving either warm, sepia, or albumen tones. Price, cabinet size, $1.35 per gross ; other sizes in proportion.

RIVO GELATINE PAPER

Works precisely like albumen paper, possesses an insoluble film and requires no alum or hardener in the fixing bath. It has great keeping qualities, and does not change color in warm weather. Price, cabinet size, $1.00 per gross ; other sizes in proportion.

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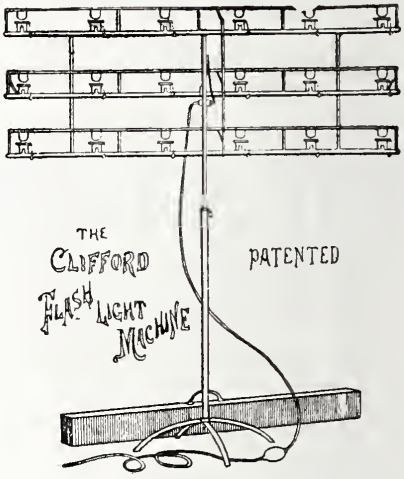
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An entirely new way of burning the powder whereby all is burned and burned instantly.

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The Clifford Flash-Light Machine is made entirely of metal. The full machine consists of three rows of six burners to the row, or one row of sixteen burners, and with this machine you can burn more powder and therefore get more light, if necessary, than with any other machine on the market.

With our mode of burning the powder, it all has to burn and instantly, and as it burns all of the powder used, it is the most economical. We use alcohol for burning, so when you get where you want to work you are all ready for business, have no gas connections to make or gas to manufacture, and you have no gasoline can to blow you up.

It has a spread of six feet, which is necessary in any machine, to give roundness to the picture. It can be easily elevated, so as to get the proper angle of lighting. This machine was invented by practical photographers for use by practical photographers for all kinds of work. It has been tested for all kinds of work that could be thought of, and under all circumstances it has never failed.

With either size machine is sent a neat, malleable iron stand of our own design, very light, rigid and strong, a carrying case, bulb and tube. No. 1 Machine consists of one row of six burners. (See cut of No. 3 Machine above, showing three rows of burners.) This gives a spread of six feet, which is necessary to give roundness to the picture. The No. 2 Machine consists of two rows and twelve burners—six to the row—each row six feet long. The No. 2 Machine has the same form as the No. 3 Machine, only one row less of burners. The No. 4 Machine consists of one row, the same as No. 1, except that instead of six burners it has twelve burners, and same capacity as No. 2. No. 5 is same as No. 1, except that it has sixteen burners, and packs into a little smaller compass than No. 1, and has nearly the capacity of No. 3. No. 5 packs, stand and all, into a box 2 x 6 in. and 6 ft. long. Nos. 4 and 5 are made for those who wish a more compact machine than Nos. 2 and 3, and do not care for the spread of light which they have.

The full machine packs into a box 4 x 5½ inches and 6 feet long, which is nicely stained and can be used as a carrying case. The full machine's weight is from seven to ten pounds. The machine can be set up and taken down in from one to five minutes.

This machine is fully guaranteed. Photographs showing work done with the machine will be sent on request. Full instructions will be sent with each machine.

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(Its price is not higher than that of any other make.)

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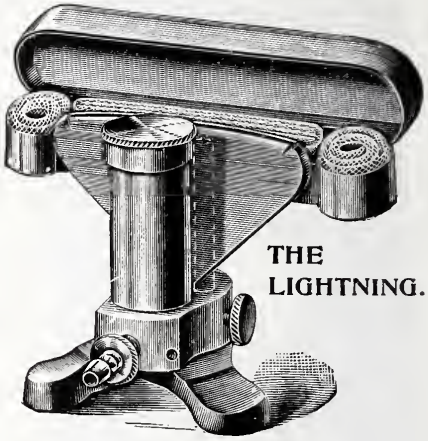
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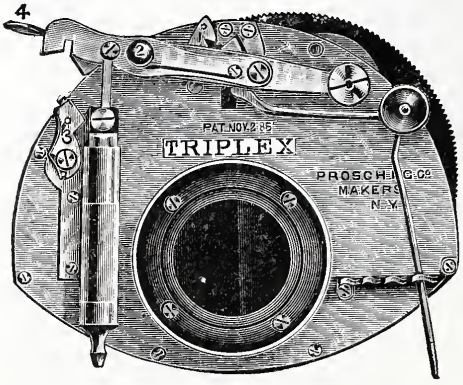


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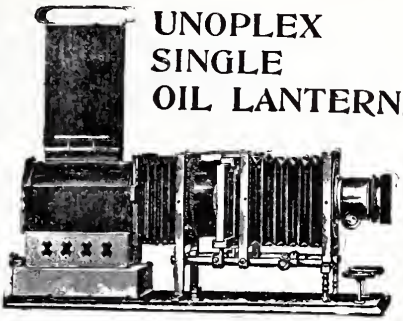
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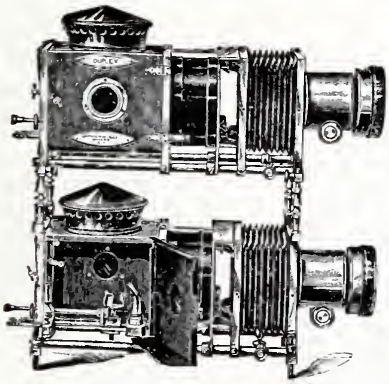
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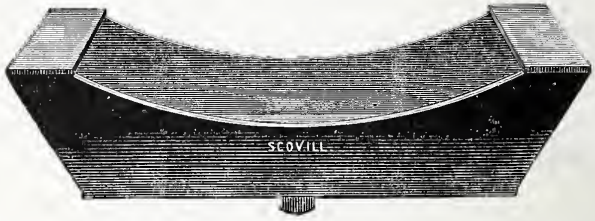
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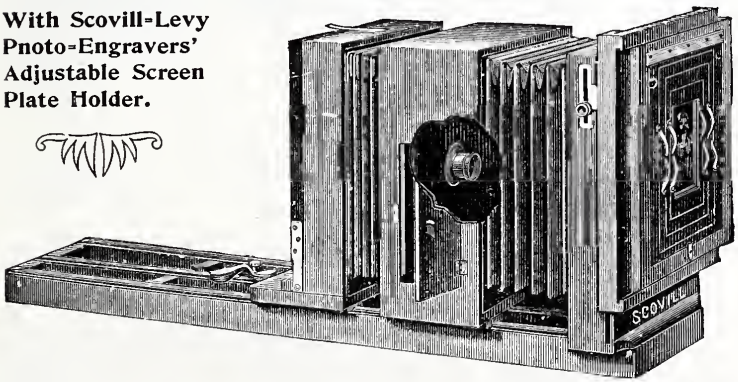
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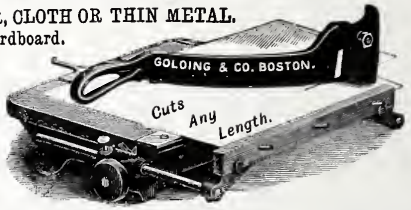
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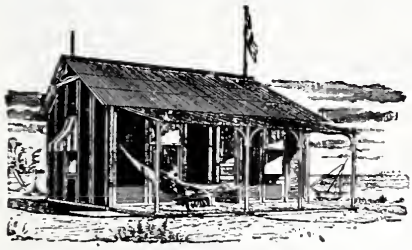
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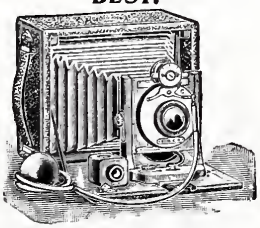
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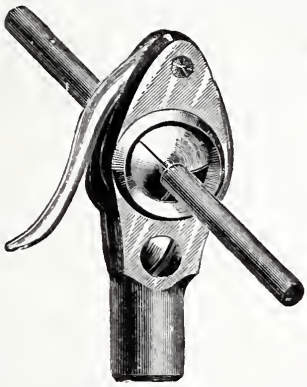
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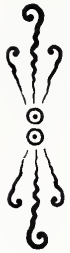
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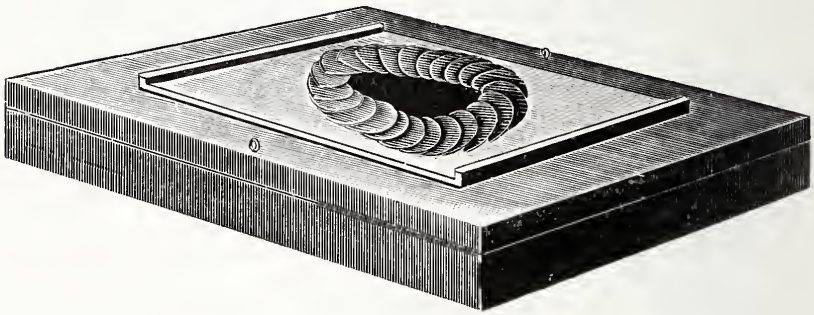
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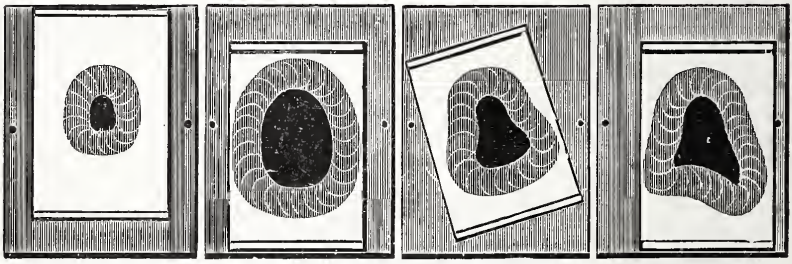
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